ELSEVIER

Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

Research Paper

Prevalence and associated factors of mental health outcomes among healthcare workers in Northern Colombia: A cross-sectional and multi-centre study

Hernan Felipe Guillen-Burgos [a,b,c,*], Janitza Gomez-Ureche [c], Carlos Renowitzky [d], Kaleb Acevedo-Vergara [a], Manuel Perez-Florez [a], Elizabeth Villalba [a], Jorge Escaf [a], Dieb Maloof [a], Riguey Torrenegra [a], Patricia Medina [a], Alberto Dau [a], Silvia Salva [a], Abdel Perez [a], Jesus Tapia [a], Soraya Salcedo [a,b], Ronald Maestre [a,b], Salvador Mattar [a], Miguel Parra-Saavedra [a], Jose Torres [a], Cesar Mesino [a], Nahir Acosta [c], Laura Mora [d], Gabriel Vega [d], Juan Francisco Galvez-Florez [a,e]

[a] *Center for Clinical and Translational Research, La Misericordia Clínica Internacional, Barranquilla, Colombia*
[b] *Facultad de Ciencias de la Salud, Universidad Simon Bolivar, Carrera 54 No 64-222, Barranquilla, Colombia*
[c] *Instituto Cardiovascular del Cesar, Valledupar, Colombia*
[d] *Clinica Centro, Barranquilla, Colombia*
[e] *Latin-American Society of Consultation – Liaison Psychiatry (SOLAPSIQUE), Bogotá, Colombia*

ARTICLE INFO

ABSTRACT

Background: Mental health outcomes in Healthcare Workers (HCWs) has been few evaluated during COVID-19 pandemic in low-and middle-income countries. Our aim was carry-out a study to identify the prevalence of stress, anxiety, depressive symptoms in HCWs and associated factors to severe illness in a northern region in Colombia.
Method: A cross-sectional, hospital-based survey was conducted to assess mental health outcomes in 1,149 HCWs in Colombia. The study used Perceived Stress Scale (PSS-10), 7-item Generalized Anxiety Disorder (GAD-7), and 9-item Patient Health Questionnaire (PHQ-9) to evaluate stress, anxiety, and depression symptoms, respectively.
Results: 682 HCWs completed the questionnaire. The 58,21% (397/682) were nurses, 31,23% were physicians (213/682), and 10,56% (72/682) were other health professionals. The proportion of HCWs with stress, anxiety, and depressive symptoms were 59,97%, 44,87%, and 23,02%, respectively. HCWs in emergency room and Intensive Care Units (ICU) have 2-3-fold increase risk to have severe symptoms of stress. Staff in ICU have 64% more likely to have severe anxiety symptoms, and 97% more likely to have severe depression symptoms.
Limitations: Including HCWs only in the northern region in Colombia; a non-probabilistic sample, and a cross-sectional design to identify causality.
Conclusion: A higher proportion on mental health outcomes has been reported in HCWs in Colombia. There are work areas related with severe mental symptoms such as ICU and emergency room. Hospitals and patient-care institutions in Latin-America needs consider the mental and physical health of HCWs during outbreaks and identify health staff at-risk to implementing support strategies to mitigate adverse mental outcomes.

1. Introduction

Mental health symptoms have been evaluated during infectious disease outbreaks with a higher prevalence of stress, anxiety, and depressive symptoms in Healthcare Workers (HCWs). Several studies have to elucidated stress-related, anxiety, and depressive symptoms in frontline and non-frontline HCWs during the COVID-19 pandemic (Benfante et al., 2020, Lai et al., 2020, Danet Danet, 2021, Marvaldi et al., 2021). However, few studies have been carried out in low-and middle-income countries (LMICs), especially in HCWs in Latin America.

During the outbreaks, significant emotional distress was identified in HCWs during and after an outbreak period (Lancee et al., 2008). In the COVID-19 pandemic, several studies have reported an important proportion of stress, anxiety, and depressive symptoms in HCWs worldwide (Lai et al., 2020, Pappa et al., 2020, Kang et al., 2020, Salazar de Pablo et al., 2020, Salari et al., 2020, Cai et al., 2020, Aymerich et al., 2022). The prevalence of mental health outcomes such as stress, anxiety, and depression varied during studies and across the countries during the pandemic. Li et al. (2021) in a published meta-analysis reported a prevalence of symptoms of depression of 21.7% and anxiety symptoms of 22.1% (Li et al., 2021). However, other meta-analysis reported a higher proportion of stress 44.86%, anxiety 41.42%, and depression symptoms 37.12% in HCWs across different countries (Mahmud et al., 2021). The above reflects the impact on mental health during the pandemic in at-risk populations such as HCWs. Furthermore, different stressful situations in the workplace have been associated with such risk factors to conduce poorly mental health outcomes in HCWs. Stressors such as increasing cases and deaths, lack of personal protection equipment, demanding workloads, isolation, uncertainty about the progression of the pandemic, and risk of contagious were some situations identified with which HCWs must deal on a daily basis (Chirico et al., 2021). Additionally, as we well know, the Latin America region suffers from severe inequalities in the healthcare system (Litewka and Heitman, 2020), which could increase the proportion of poor physical and mental health outcomes in HCWs during outbreaks or pandemics.

The studies have demonstrated that HCWs are at-risk population that needs effective interventions to support and mitigate their possible poor mental health outcomes. Further attention needs to be focused on the HCWs in LMICs due to the disparities in the healthcare system in infrastructure, equipment, facilities, and treatments. Besides, there is an underrepresented the Latin American of HCWs population in those studies and also a significant level of heterogeneity has been identified among the psychological assessments which makes it difficult for their external validity.

In this sense, our first aim is to report the prevalence of poor mental health outcomes such as stress, anxiety, and depression symptoms in HCWs during the second wave of the COVID-19 pandemic in the northern region of Colombia. Second, to evaluate the possible associated factors related to attendance during the COVID-19 pandemic and mental health outcomes by HCWs.

2. Methods

The study followed the Equator Network recommendations with the STROBE guidelines (von Elm et al., 2014) for observational studies and The Good Practice in the Conduct and Reporting of Survey Research (Kelley, 2003).

2.1. Design

A cross-sectional, hospital-based survey study was conducted to assess perceived stress, anxiety, and depression symptoms among HCWs in three teaching hospitals in Colombia.

2.2. Settings

Two hospitals were located in Barranquilla (La Misericordia Clínica Internacional, LMCI; Clinica Centro, CC) and another one located in the city of Valledupar (Instituto Cardiovascular del Cesar, ICVC) in the northern region of Colombia during the second wave of COVID-19 pandemic from May 15th to June 15th, 2021.

2.3. Participants

We calculated the sample with the following formula $N = Z_\alpha^2 P(1 - P) / d^2$, in which $\alpha = 0,05$, $Z_\alpha = 1.96$, and $d = 0,05$ of marginal error.

Previous studies have reported a 45% proportion of psychological symptoms in healthcare workers during the SARS-CoV2 pandemic in China (Lai et al., 2020). We used 45% as proportion of mental health status in HCWs. We amplified the sample size by 50% with at least 570 completed questionnaires from participants.

The HCWs were collected through a convenience sample according to their interest to participate. We include a total list of 1,149 employers throughout a self-administered questionnaire via email. The eligibility criteria to participate were being a male or female in the front and non-frontline healthcare workers who have agreed to participate in the study. All participants were affiliated with any of the three teaching hospitals and have worked during COVID-19 pandemic in the second wave. No exclusion criteria were considered.

2.4. Variables

A self-administered questionnaire was generated in REDcap (version 7.0.16, licensed by Vanderbilt University) to respond by HCWs during the second wave. Questionaries with incomplete data were excluded from the analysis. After receiving an email invitation, those who were interested in summiting their survey as data to be included in the study continued to answer the survey freely. The survey was sent to an email list acquired from the human resources (HR) office of each hospital. The survey included questions on demographic, work-related, and COVID-19 exposure information as explanatory variables, as well as a mental health component assessment of perceived stress, anxiety, and depressive symptoms with the scales 10-items Perceived Stress Scale (PSS-10), 7-items Generalized Anxiety Disorder (GAD-7), and 9-items Patient Health Questionnaire (PHQ-9), respectively. The outcome variables were defined as positive symptoms of stress, anxiety, and depression derived from the psychological assessments.

2.5. Clinical assessments

Participants were asked to report through a standardized protocol their demographic data, and their mental health status that was assessed using the Spanish versions of the psychometric scales selected.

2.5.1. Perceived Stress Scale (PSS-10)

The Perceived Stress Scale is a 10-item widely used psychological instrument for measuring the perception of stress (Cohen, Kamarck, and Mermelstein, 1983). A cutoff point of $\geq$15 was indicative of perceived stress according to the study published by Liu et al. (2021) in HCWs. A total symptom severity score range between 0 and 40 points. Severity scores ranged was 0–13 (low stress), 14–26 (moderate stress), and 27–40 (high perceived stress). The Spanish version was extracted from a previously published study on students in Colombia (Campo-Arias et al., 2009). This scale had good internal consistency with a Cronbach's value (0,86) assessed previously in Colombia (Campo-Arias et al., 2009).

2.5.2. The 7-item Generalized Anxiety Disorder Scale (GAD-7)

General Anxiety symptoms were evaluated with the 7-item Generalized Anxiety Disorder Scale. This is a self-administered, useful tool for screening anxiety symptoms and probable cases of General Anxiety Disorder (GAD) (Spitzer et al., 2006). The cutoff point was set in $\geq$5 according to Spitzer et al. (2006). Previous studies have used the GAD-7 scale for healthcare workers (Sheraton et al., 2020). In Colombia, Camargo et al. (2021) validated the instrument in healthcare workers during the COVID-19 pandemic with excellent internal consistency (Cronbach's value = 0,92) (Camargo et al., 2021).

2.5.3. The 9-item Patient Health Questionnaire (PHQ-9)

The 9-item Patient Health Questionnaire is a self-administered scale for detecting depressive symptoms in primary care. Level of depression ranging from a score of 1–4 (minimal), 5–9 (mild), 10–14 (moderate), 15–19 (moderately severe) and 20–27 (severe). We used a cut-off point

≥ 7 to screen the prevalence of depressive symptoms according to a previous validity study in adults in Colombia (Cassiani-Miranda et al., 2021). Cassiani-Miranda et al. (2021) reported a Cronbach's value of 0, 80 in primary care in Colombia.

2.6. Ethical approval

The study was submitted to The Universidad Simon Bolivar Ethics Committee and was approved. All participants signed a written informed consent inside the survey. To assure participants' privacy and confidentiality, the data were anonymized.

2.7. Statistical analysis

Statistical analysis was conducted using STATA v17.0 SE-Standard Edition (Stata Corp LLC, College Station, TX). Univariate and bivariate analyses were assessed; continuous variables were presented as means and standard deviations or median and interquartile ranges (IQRs) as appropriate. Categorical variables were presented as frequency and percentage. Mann-Whitney U and Kruskal Wallis Tests were applied to variables with non-normal distribution. The point prevalence of stress, anxiety, and depressive symptoms was displayed from May 15th, 2021 to June 15th, 2021. We used an ordinal logistic regression model to assess the risk of severity of the outcomes with the explanatory variable collected. In the above scenario, we aimed to identify an explanation model to evaluate the risk to develop mental health severity symptoms in HCWs during the COVID-19 pandemic. To evaluate the potential confounders and interactions, we applied an association analysis to identify statistical significance between potential confounders with the exposure and outcomes variables. As well, we selected confounder variables according to clinical relevance, and literature. The model was adjusted for potential confounders such as age, gender, marital status, socioeconomic status, education, ethnicity, occupation, work area, attention of patients with COVID-19, and previous diagnosis of SARS-CoV2/COVID-19 during the last 12 months. All probability values were two-tailed, the error alpha was = .05, and 95% confidence interval (CIs).

3. Results

3.1. Demographic characteristics

A total of 1,149 HCWs located in three teaching hospitals, during the second wave of the COVID-19 pandemic in Colombia (May 15th to June 15th, 2021) were invited to participate in the study. 682 completed questionnaires (59,35% response rate) were received with completed data. The 58,21% (397/682) were nurses, 31,23% were physicians (213/682), and 10,56% (72/682) were Other Health Professionals (OHPs, e.g., physiotherapists, bacteriologists, psychologists, social workers, administrative staff in attendance area). The median age was 32 years old (IQR, 39–27) in the sample. 75,07% (512/682) of the overall were women, and 24,93% (170/682) were men. The demographic characteristics are shown in Table 1.

3.2. Prevalence of mental health symptoms in healthcare workers

We calculate the proportion of participants with positive symptoms of stress, anxiety, and depression using previously published cutoff values of the PSS-10[19], GAD-7[21], and PHQ-9[24] scales, respectively. In our sample, the prevalence of HCWs with stress, anxiety, and depression was 59,97% (409/682), 44,87% (306/682), and 23,02% (157/682), respectively.

In the overall of HCWs, 32,55% (222/682), 64,52% (440/682), and 2,93 (20/682) perceived mild, moderate, and severe stress symptoms, respectively. According to the cutoff value reported in the GAD-7 scale, the total of HCWs assessed shows, 55,13% (376/682), 26,25% (179/

Table 1
Demographic characteristics of healthcare workers.

Characteristic	Total	Gender Men	Women	P value
Overall	682 (100)	170 (24,93)	512 (75,07)	
Age				
18-44	610 (100)	147 (24,10)	463 (75,90)	0,146
≥45	72 (100)	23 (31,94)	49 (68,06)	
Personal Status				
Unmarried	366 (100)	83 (22,68)	283 (77,32)	0,144
Married	316 (100)	87 (27,53)	229 (72,47)	
Education				
Technician	198 (100)	49 (24,75)	149 (75,25)	0,869
Undergraduate	230 (100)	55 (23,91)	175 (76,09)	
Postgraduate	254 (100)	66 (25,98)	188 (74,02)	
Occupation				
Nurses	397 (100)	71 (17,88)	326 (82,12)	<.001
Physicians	213 (100)	90 (42,25)	123 (57,75)	
Other Health Professionals	72 (100)	9 (12,50)	63 (87,50)	
Working Area				
Inpatient	197 (100)	47 (23,86)	150 (76,14)	0,108
Emergency Room	216 (100)	66 (30,56)	150 (69,44)	
Intensive Care Unit	185 (100)	41 (22,16)	144 (77,84)	
Others	84 (100)	16 (19,05)	68 (80,95)	
Hospital				
Hospital 1 (LMCI)	396 (100)	103 (26,01)	293 (73,99)	0,282
Hospital 2 (ICVC)	154 (100)	31 (20,13)	123 (79,87)	
Hospital 3 (CC)	132 (100)	36 (27,27)	96 (72,73)	
City				
Barranquilla	528 (100)	139 (26,33)	389 (73,67)	0,118
Valledupar	154 (100)	31 (20,13)	123 (79,87)	
Frontline				
Yes	309 (100)	89 (28,80)	220 (71,20)	<.033
No	373 (100)	81 (21,72)	292 (78,28)	
12-months previous COVID-19 infection?				
Yes	182 (100)	49 (26,92)	133 (73,08)	0,467
No	500 (100)	121 (24,20)	379 (75,80)	

LMCI: La Misericordia Clínica Internacional; ICVC: Instituto Cardiovascular del Cesar; CC: Clínica Centro
Other Health Professional: physiotherapist, bacteriologist, psychologist, social workers, administrative staff in patient-care areas

682), 14,22% (97/682), and 4,40% (30/682) of minimal, mild, moderate and severe anxiety symptoms, respectively. Finally, the overall of HCWs reported 62,17% (424/682), 24,49% (167/682), 8,21% (56/682), 2,64% (18/682), 2,49% (17/682) minimal, mild, moderate, moderately severe, and severe symptoms of depression, according to the PHQ-9 scale, respectively.

3.3. Associated factors with mental health symptoms in healthcare workers

The following HCWs experience more stress symptoms: married than unmarried ($\chi^2 = 6.68$, $df = 1$, $p = 0.010$). Nurses than physicians ($\chi^2 = 8.99$, $df = 2$, $p = 0.011$). HCWs working in ER than inpatient area ($\chi^2 = 18.38$, $df = 3$, $p < .001$). HCWs working in ICU than inpatient area ($\chi^2 = 18.38$, $df = 3$, $p < .001$). Barranquilla than Valledupar city ($\chi^2 = 59.75$, $df = 1$, $p < .001$). HCWs in the frontline (attendance to COVID-19 patients) than non-frontline (non-attendance to COVID-19 patients) ($\chi^2 = 19.75$, $df = 1$, $p < .001$). About anxiety symptoms, HCWs between 18 and 44 years experience more anxiety symptoms than HCWs ≥ 45 years ($\chi^2 = 19.75$, $df = 1$, $p < .001$). ICU staff than other areas (surgical rooms/clinical laboratory) ($\chi^2 = 9.79$, $df = 1$, $p < .020$). HCWs in Barranquilla than Valledupar city ($\chi^2 = 6.73$, $df = 1$, $p = .009$). Depressive symptoms were presented more in HCWs between 18 and 44 years than HCWs ≥ 45 years ($\chi^2 = 11.73$, $df = 1$, $p = .001$). Unmarried than married HCWs ($\chi^2 = 9.33$, $df = 1$, $p = .002$). ICU staff than other areas (surgical rooms/clinical laboratory) ($\chi^2 = 8.23$, $df = 3$, $p < .041$). See Table 2.

3.4. Predictor factors of mental health outcomes

To evaluate the risk of having severe symptoms of mental health outcomes assessed in the HCWs, we performed an ordinal logistic regression analysis after controlling for possible confounders. Regarding perceived stress symptoms, HCWs in ER have 2,12 times more likely, and staff in ICU working area have 2,27 times more likely to have severe stress symptoms compared to staff in inpatients areas See Table 3.

Other Health Professionals have 2,25 times more likely to have severe anxiety symptoms compared to nurses, and health professionals in ICU have 64% more likely of having severe anxiety symptoms than HCWs in inpatients areas. Physicians have 49% more likely, and Other Health Professionals have 2,60 times more likely to have severe depressive symptoms in our sample. Finally, HCWs in ICU having 97% more likely to have severe depressive symptoms compared to HCWs in inpatients areas See Table 3.

4. Discussion

Healthcare workers in the northern region of Colombia have an increased risk to develop mental symptoms of stress, anxiety, and depression during the COVID-19 pandemic. Our findings showed the following important results: (i) a higher prevalence of mental health symptoms in HCWs in the sample analyzed during the second wave of COVID-19 in the northern region of Colombia; (ii) associated factors related to demographic and work-related characteristics with positive mental symptoms, and (iii) predictor factors associated to an increased risk for poor mental health outcomes.

Potential stressful life events increase the risk for disease when one perceives that these events exceed a person's adaptive capacity (Cohen and Janicki-Deverts, 2012, Lazarus and Folkman, 1984). That is how the perception of stress may cause negative affective states such as a feeling of anxiety and depression with direct effects on physiological and behavioral patterns that influence the development of disease (Cohen et al., 2007). Previous studies have reported different sources of stress in HCWs such as transmitting COVID-19 to family and loved ones, the health of family/friends, social distance from family, and lack of personal protection equipment, among others (Shechter et al., 2020).

Acute stress disorder was identified in various studies during the

COVID-19 pandemic around the world (Aymerich et al., 2022, Shechter et al., 2020). We reported a higher prevalence of perceived stress around 60% for HCWs. This result is higher compared to the pooled prevalence reported in other published studies (Saragih et al., 2021). During the peak of the second wave of the COVID-19 pandemic in Colombia, most of the cities in the northern region of the country such as Barranquilla and Valledupar had a healthcare system overwhelmed. This situation generated a work overload in the frontline and non-frontline HCWs and also a higher perceived stress. In this sense, HCWs working with COVID-19 patients in areas such as ICU and ER reported a positive association with stress symptoms in our sample. Previous studies have reported the negative impact of COVID-19 on the mental health of ICU and ER professionals (Laurent et al., 2021, Yeo et al., 2021) and this complies with those reported in this study. Moreover, our findings also identified a higher prevalence of symptoms in nurses (62.84%) compared to physicians (27.87%). Shechter et al. (2020) in New York reported a higher prevalence of screening stress symptoms in nurses, 64%, compared to residents and fellows, 54%, and attending physicians, 40% (Shechter et al., 2020). In the Colombian context, Pedrozo-Pupo et al. (2020) created a modified version of PSS-10 for COVID-19 (PSS-10-C). In this study, 14,3% of participants (n=407) scored for high perceived stress (Pedrozo-Pupo et al., 2020). In another study in the Colombian HCWs population, Campo-Arias et al. (2021) identified in the score of PSS-10-C a mean of 12,5 (SD ±5,17) in nurses, and a mean of 13,59 (SD ±6,38) in physicians (Campo-Arias et al., 2021), however, those scores are related to an adapted PSS to COVID-19. In our sample with the PSS-10 instrument, the mean stress score in nurses was 16,87 (SD ±5,82) and the mean for physicians was 15,28 (SD ±6,03), higher than the Campo-Arias et al. (2021) study.

Although only 1,85% of HCWs working in ER and 3,78% of HCWs working in ICU reported high perceived stress symptoms, in our ordinal regression analysis we identified an important risk association between these groups or healthcare workers in these areas and the development of severe symptoms (OR = 2,12; 95% CI 1,37-3,30; p<.001; OR = 2,27; 95% CI 1,43-3,58; p<.001) respectively. We did not identify the age groups as a probable risk factor associated with high perceived symptoms, however, a study published by Kader et al. (2021) evaluated the perceived stress symptoms in intensive care unit staff with an important association between HCWs in the 20-34 year age group compared to the reference age group (OR = 3,72; 95% CI 1,10-12,60; p <.035) (Kader et al., 2021). Another important result obtained previously, reported that HCWs in Ethiopia working in medical areas in public hospitals were 3,07 times more likely to perceive moderate stress symptoms than staff working in surgical rooms (OR = 3,07; 95% CI 1,36-6,92; p<.007) (Teshome et al., 2021).

Our findings also reported a higher prevalence of anxiety symptoms in the sample. In the first year of the COVID-19 pandemic, anxiety had a pooled prevalence in HCWs of 23.21% (95% IC, 17.7-29.13, p<.001) (Pappa et al., 2020). Nevertheless, a recent meta-analysis with larger sample sizes (n=271.319) reported anxiety symptoms prevalence of 42% (95% IC, 35-48, p<.001) in HCWs during the SARS-CoV2 virus pandemic (Aymerich et al., 2022). In a Colombian sample in Medellin, a study reported a prevalence of anxiety symptoms in 31,7% of HCWs (Restrepo-Martínez et al., 2021). However, our results are higher compared to the HCWs in Medellin and are similar to the findings reported in the meta-analysis published by Aymerich et al. (2022) (44.87% vs 42%). Specific sources of anxiety and fear have been identified in healthcare professionals during stressful events. These sources are access to appropriate personal protective equipment; being exposed to COVID-19 at work and transmitting the infection to family and loved ones; limited access to testing; uncertainty about the course of diseases, progression, and possible treatments; excessive workloads; isolation; lack of access to up-to-date information (Shanafelt et al., 2020). Those events may increase the risk of developing acute symptoms of anxiety related to work experience and exposure to an outbreak or pandemic.

Age previously has been associated with anxiety in different

Table 2

Factors associated with mental health outcomes in healthcare workers.

		PSS-10				GAD-7				PHQ-9		
	Total, n (%)	<15	≥15	p value	Total, n (%)	<5	≥5	p value	Total, n (%)	<7	≥7	p value
Total	682 (100)				682 (100)				682 (100)			
Age groups												
18-44	610 (100)	246 (40,33)	364 (59,67)	0,643	610 (100)	325 (53,28)	285 (46,72)	<.005	610 (100)	458 (75,00)	152 (24,92)	<.001
≥45	72 (100)	27 (37,50)	45 (62,50)		72 (100)	51 (70,83)	21 (29,17)		72 (100)	67 (93,06)	5 (6,94)	
Sex												
Male	170 (100)	69 (40,59)	101 (59,41)	0,864	170 (100)	88 (51,76)	82 (48,24)	0,308	170 (100)	129 (75,88)	41 (24,12)	0,695
Female	512 (100)	204 (39,84)	308 (60,16)		512 (100)	288 (56,25)	224 (43,75)		512 (100)	396 (77,34)	116 (22,66)	
Marital status												
Unmarried	366 (100)	163 (44,54)	203 (55,46)	<.001	366 (100)	200 (54,64)	166 (45,36)	0,783	366 (100)	265 (72,40)	101 (27,60)	<.002
Married	316 (100)	110 (34,81)	206 (65,19)		316 (100)	176 (55,70)	140 (44,30)		316 (100)	260 (82,28)	56 (17,72)	
Education												
Technician	198 (100)	69 (34,85)	129 (65,15)	0,091	198 (100)	101 (51,01)	97 (48,99)	0,197	198 (100)	154 (77,78)	44 (22,22)	0,84
Undergraduate	230 (100)	90 (39,13)	140 (60,87)		230 (100)	137 (59,57)	93 (40,43)		230 (100)	174 (75,65)	56 (24,35)	
Postgraduate	254 (100)	114 (44,88)	140 (55,12)		254 (100)	138 (54,33)	116 (45,67)		254 (100)	197 (77,56)	57 (22,44)	
Occupation												
Nurses	397 (100)	140 (35,26)	257 (64,74)	<.011	397 (100)	232 (58,44)	165 (41,56)	0,114	397 (100)	318 (80,10)	79 (19,90)	<.063
Physicians	213 (100)	99 (46,48)	114 (53,52)		213 (100)	109 (51,17)	104 (48,83)		213 (100)	153 (71,83)	60 (28,17)	
Other Health Professionals	72 (100)	34 (47,22)	38 (52,78)		72 (100)	35 (48,61)	37 (51,39)		72 (100)	54 (75,00)	18 (25,00)	
Working area												
Inpatient	197 (100)	100 (50,76)	97 (49,24)	<.001	197 (100)	117 (59,39)	80 (40,61)	<.02	197 (100)	157 (79,70)	40 (20,30)	<.041
ER	216 (100)	70 (32,41)	146 (67,59)		216 (100)	113 (52,31)	103 (47,69)		216 (100)	167 (77,31)	49 (22,69)	
ICU	185 (100)	64 (34,59)	121 (65,41)		185 (100)	90 (48,65)	95 (51,35)		185 (100)	130 (70,27)	55 (29,73)	
Others	84 (100)	39 (46,43)	45 (53,57)		84 (100)	56 (66,67)	28 (33,33)		84 (100)	71 (84,52)	13 (15,48)	
Hospital												
Hospital 1 (LMCI)	396 (100)	88 (22,22)	308 (77,78)	<.001	396 (100)	225 (56,82)	171 (43,18)	<.028	396 (100)	323 (81,57)	73 (18,43)	<.001
Hospital 2 (ICVC)	154 (!00)	102 (66,23)	52 (33,77)		154 (!00)	71 (46,10)	83 (53,90)		154 (!00)	100 (64,94)	54 (35,06)	
Hospital 3 (CC)	132 (100)	83 (62,88)	49 (37,12)		132 (100)	80 (60,61)	52 (39,39)		132 (100)	102 (77,27)	30 (22,73)	
City												
Barranquilla	520 (100)	170 (32,20)	358 (67,80)	<.001	520 (100)	277 (52,46)	251 (47,54)	<.009	520 (100)	398 (75,38)	130 (24,62)	0,066
Valledupar	154 (100)	103 (66,88)	51 (33,12)		154 (100)	99 (64,29)	55 (35,71)		154 (100)	127 (82,47)	27 (17,53)	
Frontline												
Yes	309 (100)	152 (49,19)	157 (50,81)	<.001	309 (100)	174 (56,31)	135 (43,69)	0,573	309 (100)	231 (74,76)	78 (25,24)	0,209
No	373 (100)	121 (32,44)	252 (67,56)		373 (100)	202 (54,16)	171 (45,84)		373 (100)	294 (78,82)	79 (21,18)	
12-months previous COVID-19 infection?												
Yes	182 (100)	65 (35,71)	117 (64,29)	0,165	182 (100)	96 (52,75)	86 (47,25)	0,45	182 (100)	143 (78,57)	39 (21,43)	0,551
No	500 (100)	208 (41,60)	292 (58,40)		500 (100)	280 (56,00)	220 (44,00)		500 (100)	382 (76,40)	118 (23,60)	

PSS-10: 10-items Perceived Stress Scale; GAD-7: 7-items Generalized Anxiety Disorder; PHQ-9: 9-items Patient Health Questionnaire
LMCI: La Misericordia Clínica Internacional; ICVC: Instituto Cardiovascular del Cesar; CC: Clínica Centro
Other Health Professionals: physiotherapist, bacteriologist, psychologist, social workers, administrative staff in patient-care a

Table 3
Multivariate ordinal regression model to severe mental health outcomes.

Variable	Adjusted OR (95% CI)	P value Category	Overall
PSS-10, stress symptoms			<.001
Working Area			
Inpatient	1 [Reference]		
Emergency Room	2,12 (1,37–3,30)	<.001	
Intensive Care Unit	2,27 (1,43–3,58)	<.001	
GAD-7, anxiety symptoms			<.001
Occupation			
Nurses	1 [Reference]		
Other Health Professional	2,25 (1,32–3,82)	<.003	
Working Area			
Inpatient	1 [Reference]		
Intensive Care Unit	1,64 (1,11–2,42)	<.013	
PHQ-9, depressive symptoms			<.001
Occupation			
Nurses	1 [Reference]		
Physician	1,49 (1,05–2,12)	<.023	
Other Health Professional	2,60 (1,47–4,60)	<.001	
Working Area			
Inpatient	1 [Reference]		
Intensive Care Unit	1,97 (1,30–2,97)	<.001	

PSS-10: 10-items Perceived Stress Scale; GAD-7: 7-items Generalized Anxiety Disorder; PHQ-9: 9-items Patient Health Questionnaire
LMCI: La Misericordia Clínica Internacional; ICVC: Instituto Cardiovascular del Cesar; CC: Clínica Centro
Other Health Professionals: physiotherapist, bacteriologist, psychologist, social workers, administrative staff in patient-care areas

epidemiological studies (Kessler and Wang, 2008, Kessler et al., 2010). HCWs between 18–44 years old had a higher prevalence of anxiety symptoms than HCWs with age ≥45 (47.72%; 29.17%; $p < .005$) with statistical differences. These results are consistent with the age of onset reported in meta-analysis, with ranges between 21.1 and 34.9 years (De Lijster et al., 2017).

Previous studies has been associated with working in critical care with moderate to extremely severe anxiety (Hammond et al., 2021, Chen et al., 2020). Additionally, we also identified differences between ICU professionals and HCWs working in areas such as clinical laboratory or surgical room. As mentioned above for stress, anxiety symptoms, in people working in stressful-settings as ICU during outbreaks or pandemics are more likely to develop anxiety symptoms as previously studies reported (Hammond et al., 2021, Zhang et al., 2020, Mokhtari et al., 2020). In French teaching hospitals, the researchers found that HCWs assigned to COVID-19 ICU were 2,08 times more likely to developing anxiety symptoms (Caillet et al., 2020). We reported that 64% were more likely to develop severe anxiety symptoms for HCWs in the ICU staff. These findings are critical knowledge for healthcare providers in LMICs to consider anxiety symptoms as one of the most prevalent mental health outcomes in healthcare professionals during outbreaks or pandemic stratified by working areas or departments.

Another important finding correlated with an increased number of cases and deaths during de second wave of SARS-CoV-2 in the northern region of Colombia, with differences between the anxiety symptoms reported between the two cities. It is possible that differences in the healthcare systems among high income countries compared with low- and middle-income countries along with the pandemic hotspots, would support our findings of a higher prevalence of anxiety symptoms and associated factors.

Depression is one of the most common mental disorders in high and low-and-middle-income countries worldwide (Bromet et al., 2011). As mentioned above, work-related stress factors could lead to develop acute mental, cognitive or behavioral symptoms, or psychiatric disorders, including depression. (De Boer et al., 2011). Working in stressful environments with exposure to infectious diseases outbreaks such as SARS evidenced a higher prevalence of depressive symptoms in HCWs (Brooks et al., 2018). A study with 1,257 HCWs in China reported 74,2% of depressive symptoms which were more prevalent as the outbreak was being brought under the control. (Chong et al., 2004). In the COVID-19 pandemic, a meta-analysis across 21 countries, showed a pooled prevalence of depression symptoms in HCWs of 21.7% (95% IC, 18.3-25.2) (Li et al., 2021). Another pooled prevalence estimation was reported at the beginning of the pandemic by Pappa et al. (2020) in 22,8% (Pappa et al., 2020). Our results are in the same line of thought, but with a higher percentage of 26,85% compared to the previous meta-analyses. Other reports in Colombia showed a prevalence of 14,6% of depressive symptoms in HCWs (Restrepo-Martínez et al., 2021). The differences between the published study by Restrepo-Martínez et al. (2021) and our results are associated with the moment of the survey, sample size, and clinical sites evaluated. Restrepo-Martínez et al. (2021) conducted their survey during the beginning of the pandemic, while our survey was performed during the second wave were increasing number of cases and deaths tolls were also reported. Additionally, our study used a lower cutoff point ≥ 7 compared to Restrepo-Martínez et al. (2021) using >10. We support our decision according to a previous publication by Cassiani-Miranda et al. (2021) validating the PHQ-9 scale in the Colombian population. This last threshold may have lead to a higher sensitivity and specificity, for mental positive scores in the Colombian sample.

Differences between score levels of depression were identified in the areas of working (p<0,001). A study published in China by Lai et al. (2020) reported that nurses, women, front-line workers, and those in Wuhan reported more severe symptoms levels of depression (Lai et al., 2020). Our findings report a risk of 49% of severe symptoms of depression for the physicians. Other Health Professionals such as bacteriologists, physiotherapists, psychologists, social workers, and administrative staff in attendance areas, have also a strong association with severe depressive symptoms. This may be due to the important and specific work perfomed by this staff (e.g., nasopharyngeal swab sample collection, support to patients, families, and medical staff, administrative issues), and a higher prevalence of moderate to severe symptoms in a reduced subgroup of the overall sample (13,88%, 10/72).

There are several strengths in this study. This is the first study evaluating mental health outcomes among healthcare workers in an important region of Colombia that had up rising cases and deaths during the waves of SARS-CoV2 / COVID-19 pandemic with overwhelmed healthcare services. Second, the timing of the assessments during a second peak of the COVID-19 pandemic, allowed us to describe the acute stressors faced by health professional staff. Third, the identification and association of professionals and working places with higher levels of stress, anxiety, and depressive symptoms. There were also few limitations, such as including HCWs only in the northern region of the country; a non-probabilistic sample with a convenience sample by invitation to participate in the survey with risk of selection bias; and HCWs were recruited in large teaching hospitals (third and fourth level), and may be not be representative of all hospitals. Finally, a cross-sectional design had the limitation in order to measure the causality.

5. Conclusions

Healthcare workers in Colombia have an important risk of severe stress, anxiety, and depressive symptoms during outbreaks such as

COVID-19 pandemic. This is true for staff working in stressful-environments such as emergency rooms and intensive care units. Our findings reported the a higher prevalence of mental health outcomes assessed in this sample of healthcare professionals. These results are important for healthcare staff, policymakers, healthcare providers, payers, and relatives of HCWs. Therefore, this results may help create strategies, recommendations, and guidelines to allow adecuate support and mitigation of the damage caused over the physical, mental and psychosocial domains by stressful events during infectious disease outbreaks or pandemics in occupational environments (Chirico et al., 2021). Mental health consequences such as Post-traumatic stress disorder (PTSD) or burnout are common after the HCWs experience stressful work-related environments during outbreaks or pandemics (Chirico et al., 2021, Chirico and Leiter, 2022). It is necessary to develop an occupational health surveillance programs in LMICs for future outbreaks and pandemics. This will promote an early recognition of physical and mental health outcomes as well as workplace mental health programs that may help to address the possible consequences in health and the wellness of the HCWs (Chirico and Nowrouzi-Kia, 2022). More studies are needed to identify causal risk factors in at-risk populations such as healthcare workers in high and low-and-middle-income countries.

Funding

Data statement

The dataset generated and/or analyzed during the current study are not publicly available due on our policy statement of sharing clinical data only request but are available from the corresponding author on reasonable request.

Author Statement

All persons who meet authorship criteria are listed as authors, and all authors certify that they have participated sufficiently in the work to take public responsibility for the content, including participation in the concept, design, analysis, writing, or revision of the manuscript. Furthermore, each author certifies that this material or similar material has not been and will not be submitted to or published in any other publication before its appearance in the Journal of Affective Disorders Reports.

CRediT authorship contribution statement

Hernan Felipe Guillen-Burgos: Conceptualization, Visualization, Formal analysis, Data curation, Writing – original draft, Writing – review & editing. **Janitza Gomez-Ureche:** Funding acquisition, Writing – review & editing. **Carlos Renowitzky:** Funding acquisition, Writing – review & editing. **Kaleb Acevedo-Vergara:** Funding acquisition. **Manuel Perez-Florez:** Funding acquisition. **Elizabeth Villalba:** . **Jorge Escaf:** Writing – review & editing. **Dieb Maloof:** Writing – review & editing. **Riguey Torrenegra:** Funding acquisition. **Patricia Medina:** Funding acquisition. **Alberto Dau:** Writing – review & editing. **Silvia Salva:** Writing – review & editing. **Abdel Perez:** Writing – review & editing. **Jesus Tapia:** Funding acquisition. **Soraya Salcedo:** Writing – review & editing. **Ronald Maestre:** Writing – review & editing. **Salvador Mattar:** Writing – review & editing. **Miguel Parra-Saavedra:** Writing – review & editing. **Jose Torres:** . **Cesar Mesino:** . **Nahir Acosta:** Funding acquisition. **Laura Mora:** Funding acquisition, Writing – review & editing. **Gabriel Vega:** Funding acquisition, Writing – review & editing. **Juan Francisco Galvez-Florez:** Formal analysis, Data curation, Writing – original draft, Writing – review & editing.

Declaration of Competing Interest

Acknowledgment

Supplementary materials

Supplementary material associated with this article can be found, in the online version, at doi:10.1016/j.jadr.2022.100415.

References

Aymerich, C., et al., 2022. COVID-19 pandemic effects on health worker's mental health: Systematic review and meta-analysis. Eur. Psychiatry 65, 1–20.

Benfante, A., Di Tella, M., Romeo, A., Castelli, L., 2020. Traumatic stress in healthcare workers during COVID-19 pandemic: a review of the immediate impact. Front. Psychol. 11, 2816.

Bromet, E., et al., 2011. Cross-national epidemiology of DSM-IV major depressive episode. BMC Med. 9, 1–16.

Brooks, S.K., Dunn, R., Amlôt, R., Rubin, G.J., Greenberg, N.A.S., 2018. Thematic review of social and occupational factors associated with psychological outcomes in healthcare employees during an infectious disease outbreak. J. Occup. Environ. Med. 60, 248–257.

Cai, Z., et al., 2020. Nurses endured high risks of psychological problems under the epidemic of COVID-19 in a longitudinal study in Wuhan China. J. Psychiatr. Res. 131, 132–137.

Caillet, A., Coste, C., Sanchez, R., Allaouchiche, B., 2020. Psychological impact of COVID-19 on ICU caregivers. Anaesth. Crit. Care Pain Med. 39, 717–722.

Camargo, L., et al., 2021. Escala de ansiedad generalizada GAD-7 en profesionales médicos colombianos durante pandemia de COVID-19: validez de constructo y confiabilidad. Rev. Colomb. Psiquiatr. https://doi.org/10.1016/J.RCP.2021.06.003.

Campo-Arias, A., Bustos-Leiton, G., Romero-Chaparro, A., 2009. Consistencia interna y dimensionalidad de la Escala de Estrés Percibido (EEP-10 y EEP-14) en una muestra de universitarias de Bogotá, Colombia. Aquichan 9, 271–280.

Campo-Arias, A., Jiménez-Villamizar, M.P., Caballero-Domínguez, C.C., 2021. Healthcare workers' distress and perceived discrimination related to COVID-19 in Colombia. Nurs. Health Sci. 23, 763–767.

Cassiani-Miranda, C.A., et al., 2021. Validity of the Patient Health Questionnaire-9 (PHQ-9) for depression screening in adult primary care users in Bucaramanga, Colombia. Rev. Colomb. Psiquiatr. (Engl. Ed.) 50, 11–21.

Chen, Q., et al., 2020. Mental health care for medical staff in China during the COVID-19 outbreak. Lancet Psychiatry 7, e15–e16.

Chirico, F., et al., 2021. Prevalence of anxiety, depression, burnout syndrome, and mental health disorders among healthcare workers during the COVID-19 pandemic: a rapid umbrella review of systematic reviews. Journla Heal. Soc. Sci. 6, 209–220.

Chirico, F., Leiter, M., 2022. Tackling stress, burnout, suicide, and preventing the "Great resignation" phenomenon among healthcare workers (during and after the COVID-19 pandemic) for maintaining the sustainability of healthcare systems and reaching the 2030 Sustainable Development G. J. Heal. Soc. Sci. 7, 9–13.

Chirico, F., Nowrouzi-Kia, B., 2022. Post-COVID-19 Syndrome and new challenges posed by climate change require and interdisciplinary approach: The role of occupational health services. J. Heal. Soc. Sci. 7, 132–136.

Chong, M.Y., et al., 2004. Psychological impact of severe acute respiratory syndrome on health workers in a tertiary hospital. Br. J. Psychiatry 185, 127–133.

Cohen, S., Janicki-Deverts, D., 2012. Who's Stressed? Distributions of psychological Stress in the United States in probability samples from 1983, 2006, and 20091. J. Appl. Soc. Psychol. 42, 1320–1334.

Cohen, S., Janicki-Deverts, D., Miller, G.E., 2007. Psychological stress and disease. JAMA 298, 1685–1687.

Cohen, S., Kamarck, T., Mermelstein, R, 1983. A global measure of perceived stress. J. Health Soc. Behav. 24, 385–396.

Danet Danet, A., 2021. Psychological impact of COVID-19 pandemic in Western frontline healthcare professionals. A systematic review. Med. Clínica (English Ed. https://doi.org/10.1016/j.medcle.2020.11.003.

De Boer, J.C., et al., 2011. Work-related critical incidents in hospital-based health care providers and the risk of post-traumatic stress symptoms, anxiety, and depression: a meta-analysis. Soc. Sci. Med. 73, 316–326.

De Lijster, J.M, et al., 2017. The age of onset of anxiety disorders. Can. J. Psychiatry. 62, 237–246.

Hammond, N.E., et al., 2021. Impact of the coronavirus disease 2019 pandemic on critical care healthcare workers' depression, anxiety, and stress levels. Aust. Crit. Care 34, 146–154.

Kader, N., et al., 2021. Perceived stress and post-traumatic stress disorder symptoms among intensive care unit staff caring for severely ill coronavirus disease 2019 patients during the pandemic: a national study. Ann. Gen. Psychiatry 20, 1–8.

Kang, L., et al., 2020. Impact on mental health and perceptions of psychological care among medical and nursing staff in Wuhan during the 2019 novel coronavirus disease outbreak: A cross-sectional study. Brain. Behav. Immun. 87, 11–17.

Kelley, K., 2003. Good practice in the conduct and reporting of survey research. Int. J. Qual. Heal. Care 15, 261–266.

Kessler, R.C., Ruscio, A.M., Shear, K., Wittchen, H.U, 2010. Epidemiology of anxiety disorders. Curr. Top. Behav. Neurosci. 2, 21–35.

Kessler, R.C., Wang, P.S, 2008. The descriptive epidemiology of commonly occurring mental disorders in the United States. Annu. Rev. Public Health 29, 115–129.

Lai, J., et al., 2020. Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. JAMA Netw. Open 3, e203976.

Lancee, W.J., Maunder, R.G., Goldbloom, D.S, 2008. Prevalence of psychiatric disorders among Toronto hospital workers one to two years after the SARS outbreak. Psychiatr. Serv. 59, 91–95.

Laurent, A., et al., 2021. Mental health and stress among ICU healthcare professionals in France according to intensity of the COVID-19 epidemic. Ann. Intensive Care 11, 1–10.

Lazarus, R., Folkman, S., 1984. Stress, Appraisal, and Coping. Springer.

Li, Y., Scherer, N., Felix, L., Kuper, H., 2021. Prevalence of depression, anxiety and posttraumatic stress disorder in health care workers during the COVID-19 pandemic: a systematic review and meta-Analysis. PLoS One 16, e0246454.

Litewka, S.G., Heitman, E.L., 2020. American healthcare systems in times of pandemic. Dev. World Bioeth. 20, 69.

Liu, Y., et al., 2021. Anxiety and depression symptoms of medical staff under COVID-19 epidemic in China. J. Affect. Disord. 278, 144–148.

Mahmud, S., Hossain, S., Muyeed, A., Islam, M.M., Mohsin, M., 2021. The global prevalence of depression, anxiety, stress, and, insomnia and its changes among health professionals during COVID-19 pandemic: a rapid systematic review and meta-analysis. Heliyon 7, e07393.

Marvaldi, M., Mallet, J., Dubertret, C., Moro, M.R., Guessoum, S.B., 2021. Anxiety, depression, trauma-related, and sleep disorders among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. Neurosci. Biobehav. Rev. 126, 252–264.

Mokhtari, R., Moayedi, S., Golitaleb, M., 2020. COVID-19 pandemic and health anxiety among nurses of intensive care units. Int. J. Ment. Health Nurs. 29, 1275.

Pappa, S., et al., 2020. Prevalence of Depression, Anxiety, and Insomnia Among Healthcare Workers During the COVID-19 Pandemic: A Systematic Review and Meta-Analysis, 88. Elsevier, pp. 901–907.

Pedrozo-Pupo, J.C., Pedrozo-Cortés, M.J., Campo-Arias, A., 2020. Perceived stress associated with COVID-19 epidemic in Colombia: an online survey. Cad. Saude Publica 36 (5), e00090520. https://doi.org/10.1590/0102-311x00090520.

Restrepo-Martínez, M., Escobar, M., Marín, L.A., Restrepo, D., 2021. Prevalencia y características clínicas de los síntomas depresivos y ansiosos de los trabajadores de una institución de salud en Medellín durante la pandemia por COVID-19. Rev. Colomb. Psiquiatr. https://doi.org/10.1016/J.RCP.2021.02.001.

Salari, N., et al., 2020. The prevalence of stress, anxiety and depression within front-line healthcare workers caring for COVID-19 patients: a systematic review and meta-regression. Hum. Resour. Health 18, 100.

Salazar de Pablo, G., et al., 2020. Impact of coronavirus syndromes on physical and mental health of health care workers: systematic review and meta-analysis. J. Affect. Disord. 275, 48–57.

Saragih, I.D., et al., 2021. Global prevalence of mental health problems among healthcare workers during the Covid-19 pandemic: A systematic review and meta-analysis. Int. J. Nurs. Stud. 121, 104002.

Shanafelt, T., Ripp, J., Trockel, M., 2020. Understanding and addressing sources of anxiety among health care professionals during the COVID-19 pandemic. JAMA 323, 2133–2134.

Shechter, A., et al., 2020. Psychological distress, coping behaviors, and preferences for support among New York healthcare workers during the COVID-19 pandemic. Gen. Hosp. Psychiatry 66, 1–8.

Sheraton, M., et al., 2020. Psychological effects of the COVID 19 pandemic on healthcare workers globally: a systematic review. Psychiatry Res. 292, 113360.

Spitzer, R.L., Kroenke, K., Williams, J.B.W., Löwe, B., 2006. A Brief measure for assessing generalized anxiety disorder: the GAD-7. Arch. Intern. Med. 166, 1092–1097.

Teshome, A., et al., 2021. Perceived stress and associated factors among health care professionals working in the context of COVID-19 pandemic in public health institutions of southern Ethiopia 2020. PLoS One 16, e0252809.

von Elm, E., et al., 2014. The strengthening the reporting of observational studies in epidemiology (STROBE) statement: guidelines for reporting observational studies. Int. J. Surg. 12, 1495–1499.

Yeo, I.H., et al., 2021. Impact of the COVID-19 pandemic on emergency department workload and emergency care workers' psychosocial stress in the outbreak area. Medicina (Kaunas) 57, 1257.

Zhang, H., et al., 2020. Anxiety symptoms and burnout among Chinese medical staff of intensive care unit: The moderating effect of social support. BMC Psychiatry 20, 1–7.