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Research Paper

Post-traumatic stress disorder, anxiety, and depression symptoms in healthcare workers during COVID-19 pandemic in Colombia



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ABSTRACT

Background: Mental health outcomes in healthcare workers (HCWs) in low- and middle-income countries (LMICs) have been poorly explored during COVID-19 pandemic. Our aim was to carry out a cross-sectional study of the prevalence of mental health symptoms in HCWs in Colombia.

Methods: A cross-sectional web-survey study was performed during the COVID-19 pandemic mid-2021 including HCWs in two hospitals in Colombia. The PCL-5, GAD-7, and PHQ-9 scales were used to assess the prevalence of symptoms and severity of PTSD, anxiety, and depression in Colombia.

Results: From 257 surveyed respondents, 44.36% were nurses, 36.58% physicians and 19.07% other health professionals. The prevalence of PTSD, anxiety, and depressive symptoms were 18.68%, 43.19%, and 26.85%, amongst HCWs. The regression model evidence a strong risk of PTSD, anxiety, and depressive symptoms in HCWs in Colombia during the second wave of COVID-19 in the middle of 2021.

Conclusions: The prevalence for several mental health symptoms in HCWs in Colombia were higher compared with the general population. HCWs are at-risk population to develop chronic symptoms and mental disorders during and after outbreaks. These results will be helpful to tailor strategies to support the physical and mental health of the HCWs in LMICs.

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1. Introduction

The COVID-19 pandemic has been related to poor mental health outcomes in the short and long term in different at-risk populations (Talevi et al., 2020). The frontline healthcare workers (HCWs) such as physicians, nurses, and other health professionals (OHPs, e.g., physiotherapists, bacteriologists, psychologists, social workers, and administrative staff in attendance area) are being exposed to situations in the workplace such as increasing cases of COVID - 19 infections in patients and fellow workers, a rise in the death rates, massive workload, unavailability of protective equipment, and inadequate support that contributes to an increase in the burden of mental illness (Vizheh et al., 2020).

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In the previous outbreaks such as SARS and MERS, the prevalence of mental symptoms in HCWs has been published in various studies (Lung et al., 2009; Nickell et al., 2004; Park et al., 2018). During the SARS-CoV2 pandemic, several studies have explored the mental health outcomes in health professionals (Kang et al., 2020; Pappa et al., 2020; Salari et al., 2020; Walton et al., 2020). The results differ between studies, countries, and populations. However, systematic reviews and meta-analyses about mental disorders in HCWs have reported thus far a higher prevalence of symptoms of post-traumatic stress disorder, anxiety, and depression in staff members (Galanis et al., 2021; Marvaldi et al., 2021; Saragih et al., 2021).

Disparities among regions have been reported earlier during the COVID-19 pandemic. Low-Middle Income Countries (LMICs) still have difficulties providing HCWs with the proper equipment, support, and safety protocols to protect physical and mental health status and guarantee adequate health service. Hence, evaluating the prevalence of symptoms and severity of mental illness in HCWs

during outbreaks and pandemics in LMICs is crucial to tailor certain strategies and plans to mitigate the burden of disease in these at-risk populations. There is little evidence of mental health outcomes in HCWs during pandemics such as COVID-19. Furthermore, there are few studies on the prevalence of specific mental health outcomes such as post-traumatic stress disorder, anxiety, and depression in Colombia with samples including a high number of HCWs. Our aim was to explore the prevalence, severity, and related factors on mental health symptoms of PTSD, anxiety and depression in HCWs in two cities in Colombia. These results might help decision-makers, hospitals, HCWs, and families to support HCWs and tailor emergency protocols during outbreaks in LMICs.

2. Methods

2.1. Design

A cross-sectional survey-based study was conducted to assess PTSD, anxiety, and depression symptoms among HCWs in two medical hospitals. One located in Barranquilla (La Misericordia Clínica Internacional, LMCI) and another one located in the city of Valledupar (Instituto Cardiovascular del Cesar, ICVC) in Colombia during the COVID-19 pandemic from July 1st to July 31st, 2021. 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). The Research centre at LMCI generated a self-administered questionnaire in REDcap (version 7.0.16, licensed by Vanderbilt University). Questionnaires with incomplete data were excluded from the analysis. After receiving an email invitation, those who were interested in submitting their responses to the survey as data to be included in the study continued to answer the survey freely. To assure participants' privacy and confidentiality, the data were anonymized. The survey included questions on demographic information as well as a mental health assessment of PTSD, anxiety, and depression symptoms. The survey was sent to an email list acquired from the human resources (HR) office of each hospital.

The study was submitted to The Universidad Simon Bolivar Ethics Committee and was approved. All participants signed a written informed consent included inside the survey.

2.2. Participants

We calculated the sample with the following formula $N = Z_{\alpha}^2 P(1-P) / d^2$, in which $\alpha = 0,05$ and $Z_{\alpha} = 1.96$, and the estimated acceptable margin of error for proportion d was 0.05. Previous studies have reported the proportion of psychological symptoms in healthcare workers during the SARS-CoV2 pandemic in China between 45 and 71.5% (Lai et al., 2020). We used 45% as a proportion of mental health status in HCWs. We invited the total healthcare workers population from the two hospitals (medical and non-medical staff) to participate in this survey. The HCWs were collected through a convenience sample according to their interest to participate. We include a total list of 844 employers throughout a self-administered questionnaire via email. Main participants included hospital staff (medical and non-medical staff) working during COVID-19 pandemic at La Misericordia Clínica Internacional (LMCI, Hospital 1) in Barranquilla, and Instituto Cardiovascular del Cesar (ICVC, Hospital 2) in Valledupar, respectively.

2.3. Clinical assessments

The participants were asked to report through a standardized protocol their demographic data, exposure to the SARS-CoV2 virus (attendance of COVID-19 patients or previous contagion), and the

mental health outcomes that were assessed using the Spanish versions of the psychometric tools selected.

2.3.1. Post-traumatic stress disorder check-list for DSM-V (PCL-5)

The Post-traumatic stress disorder Checklist for DSM-V is a 20-item self-report measure in symptoms related to PTSD according to DSM-V criteria. The scale is a 5-point Lykert type, and participants are asked to rate the severity of their experiences (Blevins et al., 2015). A cutoff point of ≥ 33 was indicative of probable PTSD (Blevins et al., 2015). A total symptom severity score with ranges between 0 and 80 points. Previous studies on HCWs during COVID-19 had used PCL-5 (Di Tella et al., 2020; Johnson et al., 2020). The Cronbach's value of the scale for this study was 0.97

2.3.2. 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 to screen for anxiety symptoms and probable cases of General Anxiety Disorder (GAD) (Spitzer et al., 2006). We set the cut off point for the GAD - 7 at ≥ 5 as included in previous studies for healthcare workers (Sheraton et al., 2020). The Cronbach's value of the scale for this study was 0.92

2.3.3. The 9-item patient health questionnaire (PHQ-9)

The 9-item Patient Health Questionnaire (PHQ-9) is a self-administered scale to detect depressive symptoms in primary care. Level of severity 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). The Cronbach's value of the scale for this study was 0.88.

2.4. 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. Categorical variables were analyzed with the Chi-square test, and also, the Mann-Whitney U and Kruskal Wallis Tests were applied to variables with non-normal distribution. The period prevalence of PTSD, anxiety and depression symptoms were displayed from July 1st, 2021 to July 31st, 2021. We used a multivariate logistic regression model creating dummy outcome variables from PCL-5, GAD-7, and PHQ-9 scores according to the cutoff values set. In the above scenario, we aimed to identify an explanation model to evaluate the risk to develop mental health 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. The model was adjusted for potential confounders such as age, gender, marital status, socioeconomic status, education, ethnicity, occupation, job area, attention of patients with COVID-19, and previous diagnosis of SARS-CoV2/COVID-19 during the last 12 months. All probability values were 2-tailed, the error alpha was = 0.05, and 95% confidence interval (CIs).

3. Results

3.1. Demographic characteristics

A total of 844 hospital HCWs located at La Misericordia Clínica Internacional (LMCI) in Barranquilla, Colombia and Instituto

Cardiovascular del Cesar (ICVC) in Valledupar, Colombia, during the COVID-19 pandemic were invited to participate in the study. We retrieved 257 completed questionnaires (30.45% response rate) and all respondents accepted to participate. Non-respondents were identified as other lines of workers inside the hospitals, contractors, and a higher proportion of administrative personnel not involved with clinical attendance areas. 114 (44.36%) nurses, 94 (36.58%) physicians, and 49 (19.07%) OHPs were evaluated. The median age was 32 years (IQR, 39–26) in the sample. The demographic characteristics are shown in Table 1.

3.2. Prevalence of mental health symptoms in healthcare workers

To calculate the proportion of participants with positive symptoms, we identified the previous cutoff point of PTSD (Blevins et al., 2015), anxiety (Spitzer et al., 2006), and depression (Cassiani-Miranda et al., 2021) symptoms in previously published studies. The proportion of probable PTSD, anxiety and depressive symptoms overall were 18.68% (48/257), 43.19% (111/257), and 26.85% (69/257), respectively.

The percentage of HCWs with probable PTSD were 16.67% (19/114) in nurses, 21.28% (20/94), physicians, and 18.37% (9/49) for OHPs. A high prevalence of anxiety symptoms was also reported in our study in nurses 40.35% (46/114), physicians 43.62% (41/94), and OHPs 48.98% (24/49), respectively. With regards to depressive symptoms, 24.56% (28/114) of nurses, 31.91% (30/94) of physicians, and 22.45% (11/49) of OHPs had results over the cutoff point established for depression in the PHQ – 9 scale. No differences were identified among HCWs subgroups in PTSD, anxiety and depressive symptoms.

Table 1
Demographic characteristics of health care workers.

Demographic Characteristics	Total	Gender		P value
		Men	Women	
Overall	257 (100)	58 (22,57)	199 (77,43)	
Age				
18–25	64 (100)	11 (17,19)	53 (82,81)	0,165
26–49	181 (100)	42 (23,20)	139 (76,80)	
≥50	12 (100)	5 (41,67)	7 (58,33)	
Personal Status				
Single	145 (100)	37 (25,52)	108 (74,48)	0,305
Married	103 (100)	21 (20,39)	82 (79,61)	
Divorced	8 (100)	0 (0)	8 (100)	
Widow	1 (100)	0 (0)	1 (100)	
Education				
High School	8 (100)	2 (25,00)	6 (75,00)	0,390
Technician	87 (100)	15 (17,24)	72 (82,76)	
Undergraduate	123 (100)	29 (23,58)	94 (76,42)	
Postgraduate	39 (100)	12 (30,77)	27 (69,23)	
Socioeconomic				
Low -Low	51 (100)	5 (9,80)	46 (90,20)	<0.019
Low	68 (100)	11 (16,18)	57 (83,82)	
Middle-Low	69 (100)	19 (27,54)	50 (72,46)	
Middle	38 (100)	11 (28,95)	27 (71,05)	
Middle-High	18 (100)	6 (33,33)	12 (66,67)	
High	13 (100)	6 (46,15)	7 (53,85)	
Working Area				
Emergency Room	44 (100)	13 (29,55)	31 (70,45)	0,303
Inpatient	81 (100)	16 (19,75)	65 (80,25)	
Intensive Care Unit	71 (100)	19 (26,76)	52 (73,24)	
Others*	61 (100)	10 (16,39)	51 (83,61)	
Attendance COVID-19 patients				
Yes	207 (100)	51 (24,64)	156 (75,36)	0,106
No	50 (100)	7 (14,00)	43 (86,00)	
Are you COVID-19 infected in the last 12-months?				
Yes	80 (100)	18 (22,50)	62 (77,50)	0,986
No	177 (100)	40 (22,60)	137 (77,40)	

* Others: clinical laboratory, diagnosis images, surgery rooms, outpatient area.

3.2.1. PTSD symptoms

The proportion of HCWs with probable PTSD is higher in the age group of 26–49 years old 70.83%, however, no statistical differences were drawn. In the sample, the chi-square test suggests a sex-differentiation between HCWs with a higher proportion of women 66.67% than men 33.33% ($\chi^2 = 3.91, df = 1, p = 0.048$). Undergraduate HCWs evidenced a proportion of 47.92% for probable PTSD compared to the other educational categories with adequate statistical differences ($\chi^2 = 8.49, df = 3, p = 0.037$). Moreover, HCWs in the frontline during the SARS-CoV2 pandemic showed a 11 times higher proportion of PTSD symptoms (91.67%) than non-frontline HCWs (8.33%) ($\chi^2 = 4.66, df = 1, p = 0.031$). See Table 2.

3.2.2. Anxiety symptoms

HCWs between 26 and 49 years old presented more anxiety symptoms, 72.07%, than HCWs between 18 and 25 years old (27.93%) ($\chi^2 = 9.91, df = 2, p = 0.007$). 31.53% of HCWs living in middle-low socioeconomic areas reported more anxiety symptoms with compared to those HCWs living in low-low socioeconomic areas ($\chi^2 = 14.54, df = 5, p = 0.012$). Furthermore, HCWs in Barranquilla reported more anxiety symptoms than HCWs in Valledupar (64.86% vs 35.14%, $\chi^2 = 11.30, df = 1, p = 0.010$). See Table 2.

3.2.3. Depressive symptoms

Depressive symptoms were higher in HCWs between 26 and 49 years old (66.67%) compared to HCWs with between 18 and 25 years old (33.33%) ($\chi^2 = 7.28, df = 2, p = 0.026$). The undergraduate HCWs reported more depressive symptoms than graduate HCWs with statistical significance (56.52% vs 4.35%, $\chi^2 = 9.25, df = 3, p = 0.026$). White/Hispanic HCWs also reported more depressive symptoms than Afro descendent HCWs (76.81% vs 23.19%, $\chi^2 = 3.86, df = 1, p = 0.049$). More depressive symptoms were reported for HCWs in Barranquilla than HCWs in Valledupar (71.01% vs 28.99%, $\chi^2 = 9.93, df = 2, p = 0.002$). Again, Frontline HCWs were more likely to show depressive symptoms (89.86%) than non-frontline HCWs (10.14%) ($\chi^2 = 5.21, df = 1, p = 0.022$) by a wide margin. See Table 2.

3.3. Severity mental health outcomes and associated factors

We used the same severity index scores for each instrument as previously established (Cassiani-Miranda et al., 2021; Dyrbye et al., 2009; Lim et al., 2020; Spitzer et al., 2006) as shown in Table 3. While GAD-7 and PHQ-9 scales have cutoff values to discriminate the severity of symptoms, which PCL-5 does not. In this sense, we reported 26.07% (67/257) of HCWs showed mild anxiety symptoms compared to 12.06% (31/257) and 5.06% (13/257) with moderate and severe symptoms respectively. The findings in the non-parametric test showed a positive association between age, hospital, socioeconomic status, and COVID-19 infection in the past 12 months with severe anxiety symptoms. See Table 3.

Regarding depression, 24.51% (63/257), 9.73% (25/257), 3.11% (8/257), and 0.39% (1/257) showed mild, moderate, moderately severe, and severe depressive symptoms respectively among the overall of HCWs. The bivariate analysis showed an association between depressive symptoms and hospital attendance of COVID-19 patients. See Table 3.

Although PCL-5 does not determine the severity of PTSD symptoms, previous reports have determined that higher values may represent possible severe outcomes (Blevins et al., 2015). In our sample, the median value was 9 points and the Interquartile Range (IQR, percentile 75 – percentile 25) was 22 – 3 points. For probable PTSD symptoms in nurses, the median value was 8 (IQR, 22–2) compared to 12 (IQR, 26–3) and 11 (IQR, 22–6) from physicians and OHPs.

HCWs in the nursing departments, described mild 27.19% (31/114), moderate 11.40% (13/114), and severe 1.75% (2/114) anxiety symptoms. Physicians reported the following proportions of mild,

Table 2
Association variables with prevalence of mental health symptoms in healthcare workers.

	PCL-5				GAD-7				PHQ-9			
	Total, n (%)	<33	≥33	p value	Total, n (%)	<5	≥5	p value	Total, n (%)	<7	≥7	p value
Total	257 (100)				257 (100)				257 (100)			
Age groups												
18–25	64 (100)	51 (79.69)	13 (20.31)	0.619	64 (100)	33 (51.56)	31 (48.44)	<0.007	64 (100)	41 (64.06)	23 (35.94)	<0.026
26–49	181 (100)	147 (81.22)	34 (18.78)		181 (100)	101 (55.80)	80 (44.20)		181 (100)	135 (74.59)	46 (25.41)	
≥50	12 (100)	11 (91.67)	1 (8.33)		12 (100)	12 (0.00)	0 (0.00)		12 (100)	12 (100)	0 (0.00)	
Gender												
Male	58 (100)	42 (72.41)	16 (27.59)	<0.048	58 (100)	32 (55.17)	26 (44.83)	0.775	58 (100)	38 (65.52)	20 (34.48)	0.136
Female	199 (100)	167 (83.92)	32 (16.08)		199 (100)	114 (57.29)	85 (42.71)		199 (100)	150 (75.38)	49 (24.62)	
Marital status												
Single	145 (100)	115 (79.31)	30 (20.69)	0.108	145 (100)	75 (51.72)	70 (48.28)	0.161	145 (100)	99 (68.28)	46 (31.72)	0.057
Married	103 (100)	88 (85.44)	15 (14.56)		103 (100)	66 (64.08)	37 (35.92)		103 (100)	82 (79.61)	21 (20.39)	
Divorced	8 (100)	6 (75.00)	2 (25.00)		8 (100)	5 (62.50)	3 (37.50)		8 (100)	7 (87.50)	1 (12.50)	
widow	1 (100)	0 (0.00)	1 (100)		1 (100)	0 (0.00)	1 (0.00)		1 (100)	0 (0.00)	1 (100)	
Socioeconomic												
Low-Low	51 (100)	46 (90.20)	5 (9.80)	0.571	51 (100)	39 (76.47)	12 (23.53)	<0.012	51 (100)	43 (84.31)	8 (15.69)	0.136
Low	68 (100)	53 (77.94)	15 (22.06)		68 (100)	39 (57.35)	29 (42.65)		68 (100)	54 (79.41)	14 (20.59)	
Middle Low	69 (100)	54 (78.26)	15 (21.74)		69 (100)	34 (49.28)	35 (50.72)		69 (100)	46 (66.67)	23 (33.33)	
Middle	38 (100)	30 (78.95)	8 (21.05)		38 (100)	15 (39.47)	23 (60.53)		38 (100)	25 (65.79)	13 (34.21)	
Middle High	18 (100)	15 (83.33)	3 (16.67)		18 (100)	11 (61.11)	7 (38.89)		18 (100)	12 (66.67)	6 (33.33)	
High	13 (100)	11 (84.62)	2 (15.38)		13 (100)	8 (61.54)	5 (38.46)		13 (100)	8 (61.54)	5 (38.46)	
Education												
High School	8 (100)	4 (50)	4 (50)	0.037	8 (100)	4 (50.00)	4 (50.00)	0.901	8 (100)	5 (62.50)	3 (37.50)	<0.026
Technician	87 (100)	69 (79.31)	18 (20.69)		87 (100)	52 (59.77)	35 (40.23)		87 (100)	63 (72.41)	24 (27.59)	
Undergraduate	123 (100)	100 (81.30)	23 (18.70)		123 (100)	68 (55.28)	55 (44.72)		123 (100)	84 (68.29)	39 (31.71)	
Postgraduate	39 (100)	36 (92.31)	3 (7.69)		39 (100)	22 (56.41)	17 (43.59)		39 (100)	36 (92.31)	3 (7.69)	
Ethnicity												
White/Hispanic	173 (100)	142 (82.08)	31 (17.92)	0.655	173 (100)	100 (57.80)	73 (42.20)	0.644	173 (100)	120 (69.36)	53 (30.64)	<0.049
Afro descent	84 (100)	67 (79.76)	17 (20.24)		84 (100)	46 (54.76)	38 (45.24)		84 (100)	68 (80.95)	16 (19.05)	
Occupation												
Nurse	114 (100)	95 (83.33)	19 (16.67)	0.697	114 (100)	68 (59.65)	46 (40.35)	0.592	114 (100)	86 (75.44)	28 (24.56)	0.365
Physicians	94 (100)	74 (78.72)	20 (21.28)		94 (100)	53 (56.38)	41 (43.62)		94 (100)	64 (68.09)	30 (31.91)	
Other Health Professionals*	49 (100)	40 (81.63)	9 (18.37)		49 (100)	25 (51.02)	24 (48.98)		49 (100)	38 (77.55)	11 (22.45)	
Working area												
ER	44 (100)	33 (75.00)	11 (25.00)	0.201	44 (100)	16 (36.36)	28 (63.64)	<0.010	44 (100)	29 (65.91)	15 (34.09)	0.236
Inpatient	81 (100)	65 (80.25)	16 (19.75)		81 (100)	48 (59.26)	33 (40.74)		81 (100)	60 (74.07)	21 (25.93)	
ICU	71 (100)	56 (78.87)	15 (21.13)		71 (100)	40 (56.34)	31 (43.66)		71 (100)	49 (69.01)	22 (30.99)	
Others**	61 (100)	55 (90.16)	6 (9.84)		61 (100)	42 (68.85)	19 (31.15)		61 (100)	50 (81.97)	11 (18.03)	
City												
Barranquilla	141 (100)	110 (78.01)	31 (21.99)		141 (100)	77 (66.38)	39 (33.62)	<0.005	141 (100)	96 (82.76)	20 (17.24)	<0.002
Valledupar	116 (100)	99 (85.34)	17 (14.66)		116 (100)	69 (48.94)	72 (51.06)		116 (100)	92 (65.25)	49 (34.75)	
Attendance COVID-19 patients												
Yes	207 (100)	163 (78.74)	44 (21.26)	<0.031	207 (100)	115 (55.56)	92 (44.44)	0.409	207 (100)	145 (70.05)	62 (29.95)	<0.022
No	50 (100)	46 (92.00)	4 (8.00)		50 (100)	31 (62.00)	19 (38.00)		50 (100)	43 (86.00)	7 (14.00)	
Are you COVID19 infected in the last 12-months?												
Yes	80 (100)	60 (75.00)	20 (25.00)	0.080	80 (100)	39 (48.75)	41 (51.25)	0.080	80 (100)	54 (67.50)	26 (32.50)	0.170
No	177 (100)	149 (84.18)	28 (15.82)		177 (100)	107 (60.45)	70 (39.55)		177 (100)	134 (75.71)	43 (24.29)	

PCL-5: Post-traumatic Stress Disorder Checklist for DSM-V; GAD-7: 7-items Generalized Anxiety Disorder; PHQ-9: 9-items Patient Health Questionnaire.

* Other Health Professionals: physiotherapist, bacteriologist, psychologist, social workers, administrative staff in attendance area.

** Others: clinical laboratory, diagnosis images, surgical rooms, outpatient areas.

moderate, and severe anxiety symptoms, 22.34% (21/94), 11.70% (11/94), and 9.57% (9/94) respectively. OHPs reported 30.61% (15/49), 14.29% (7/49), and 4.08% (2/49) of mild, moderate, and severe anxiety symptoms, respectively. No statistical differences were reported.

Nurses reported mild 22.81% (26/114), moderate 10.53% (12/114), moderately severe 1.75% (2/114) and severe depressive symptoms 0% (0/114). Physicians also reported 23.40% (22/94), 10.64% (10/94), 5.32% (5/94), and 1.06% (1/94) of severity symptoms. Finally, OHPs reported 30.61% (15/49), 6.12% (3/49), 2.04% (1/49) and 0% (0/49) of mild, moderate, moderately severe, and severe depression symptoms respectively. As above, no statistical differences were reported.

3.4. Predictor factors of mental health outcomes

A penalized multiple logistic regression analysis was performed after controlling for possible confounders (education, profession,

gender, hospital, attendance COVID19 patients, previous SARS-CoV2 contagion) for positive symptoms of PTSD, anxiety, and depression. Regarding PTSD symptoms, the explanatory model shows that there are 2.36 times more likely to have PTSD symptoms if HCWs have had suffered from COVID-19 in the last 12 months, 4.08 times more likely if HCWs have been exposed to COVID-19 patients, and 3.3 times more likely if HCWs are OHPs compared to nurses (OR = 2.36; 95% CI 1.16–4.81; $p < 0.017$; OR = 4.08; 95% CI 1.23–13.50; $p < 0.021$; OR = 3.28; 95% CI 1.04–10–27; $p < 0.041$). See Table 4.

OHPs have 5.08 times more likely of having anxiety symptoms compared to nurses (OR = 5.08; 95% CI 1.95–13.23; $p < 0.001$). HCWs in ICVC have an association risk to report positive anxiety symptoms (OR = 2.70; 95% CI 1.40–5.19; $p < 0.003$). With regards to depressive symptoms, there is an association between being directly exposed in the frontline to COVID-19 patients and reporting on significant symptoms of depression (OR = 2.39; 95% CI 1.01–5.69; $p < 0.047$). See Table 4.

Table 3
Severity mental health outcomes and associated factors.

	CAD-7					PHQ-9							
	Minimal	Mild	Moderate	Severe	Total	P value	None	Mild	Moderate	Moderately Severe	Severe	Total	P value
Age													
18–25	33 (51,56)	20 (31,25)	3 (4,69)	8 (12,50)	64 (100)	<0.001	38 (59,38)	15 (23,44)	6 (9,38)	4 (6,25)	1 (1,56)	64 (100)	0,081
26–49	101 (55,80)	47 (25,97)	28 (15,47)	5 (2,76)	181 (100)		111 (61,33)	47 (25,97)	19 (10,50)	4 (2,21)	0 (0,00)	181 (100)	
≥50	12 (100)	0 (0,00)	0 (0,00)	0 (0,00)	12 (100)		11 (91,67)	1 (8,33)	0 (0,00)	0 (0,00)	0 (0,00)	12 (100)	
Socioeconomic													
Low -Low	39 (76,47)	8 (15,69)	3 (5,88)	1 (1,96)	51 (100)	<0.014	39 (76,47)	9 (17,65)	3 (5,88)	0 (0,00)	0 (0,00)	51 (100)	0,084
Low	39 (57,35)	17 (25,00)	8 (11,76)	4 (5,88)	68 (100)		44 (64,71)	17 (25,00)	6 (8,82)	1 (1,47)	0 (0,00)	68 (100)	
Middle-Low	34 (49,28)	21 (30,43)	13 (18,84)	1 (1,45)	69 (100)		35 (50,72)	23 (33,33)	8 (11,59)	2 (2,90)	1 (1,45)	69 (100)	
Middle	15 (39,47)	13 (34,21)	7 (18,42)	3 (7,89)	38 (100)		22 (57,89)	8 (21,05)	3 (7,89)	5 (13,16)	0 (0,00)	38 (100)	
Middle-High	11 (61,11)	5 (27,78)	0 (0,00)	2 (11,11)	18 (100)		12 (66,67)	4 (22,22)	2 (11,11)	0 (0,00)	0 (0,00)	18 (100)	
High	8 (61,54)	3 (23,08)	0 (0,00)	2 (15,38)	13 (100)		8 (61,54)	2 (15,38)	3 (23,08)	0 (0,00)	0 (0,00)	13 (100)	
Hospital													
Hospital 1 (LMCI)	77 (66,38)	23 (19,83)	13 (11,21)	3 (2,59)	116 (100)	<0.006	79 (68,10)	31 (26,72)	5 (4,31)	1 (0,86)	0 (0,00)	116 (100)	<0.017
Hospital 2 (ICVC)	69 (48,94)	44 (31,21)	18 (12,77)	10 (7,09)	141 (100)		81 (57,45)	32 (22,70)	20 (14,18)	7 (4,96)	1 (0,71)	141 (100)	
Attendance COVID-19 patients													
Yes	115 (55,56)	51 (24,64)	29 (14,01)	12 (5,80)	207 (100)	0,166	123 (59,42)	53 (25,60)	23 (11,11)	7 (3,38)	1 (0,48)	207 (100)	<0.042
No	31 (62,00)	16 (32,00)	2 (4,00)	1 (2,00)	50 (100)		37 (74,00)	10 (20,00)	2 (4,00)	1 (2,00)	0 (0,00)	50 (100)	
Are you COVID19 infected in the last 12-months?													
Yes	39 (48,75)	21 (26,25)	13 (16,25)	7 (8,75)	80 (100)	<0.031	47 (58,75)	18 (22,50)	11 (13,75)	4 (5,00)	0 (0,00)	80 (100)	0,269
No	107 (60,45)	46 (25,99)	18 (10,17)	6 (3,39)	177 (100)		113 (63,84)	45 (25,42)	14 (7,91)	2 (2,26)	1 (0,56)	177 (100)	

GAD-7: 7-items Generalized Anxiety Disorder; PHQ-9: 9-items Patient Health Questionnaire.

Table 4
Multivariate model of mental health outcomes in HCWs.

Associated Factors	Mental Health Outcomes				
	OR	aOR	CI 95%		P value
			Min	Max	
PTSD Symptoms					
Attendance COVID19 patients	3,1	4,08	1,23	13,5	<0.021
Previous SARS-CoV2 contagion	1,77	2,36	1,16	4,81	<0.017
Other Health Professionals	1,1	3,28	1,04	10,27	<0.041
Anxiety Symptoms					
Other Health Professionals	1,41	5,08	1,95	13,23	<0.001
Hospital 2	2,06	2,7	1,4	5,19	<0.003
Depressive Symptoms					
Attendance COVID-19 patients	2,62	2,39	1,1	5,69	<0.047

Adjusted by age, sex, gender, occupation, working area, hospital and location.
OR: raw Odds Ratio; aOR: adjusted Odds Ratio.

4. Discussion

Our results on mental health outcomes in HCWs during the COVID-19 pandemic in Colombia revealed several important findings for at-risk population. First, we identified the prevalence of the mental health outcomes assessment for the most prevalent psychiatric symptoms in other cohorts and samples. Second, our findings also report factors strongly associated with poor mental health outcomes for our both country and the Latin-American region.

HCWs are at-risk population for PTSD due to a high and stressful work-related complex medical situations (Carmassi et al., 2020). In non-pandemic conditions, health personnel in a hospital have a prevalence of PTSD symptoms of 9.6% measured previously in resuscitation providers at baseline (Guillén-Burgos & Gutiérrez-Ruiz, 2018; Walton et al., 2020). Other study in nurses reported a prevalence of PTSD symptoms of 22% in teaching hospitals (Mealer et al., 2009). In infectious outbreaks or pandemics, these risk factors are increased by the uncertainty related to positive or negative outcomes in patients, and possible negative consequences for HCWs. Our results reported a prevalence of probable PTSD of 18.68% (48/257). Recent research has published PTSD pooled prevalence of 20.2% (95% IC, 9.9–33.0) in HCWs during the COVID-19 pandemic (Marvaldi et al., 2021). However, our prevalence (18.68%) is closely related to the pooled prevalence reported in the systematic review by Marvaldi et al. (2021). Thus, our results are headed in a similar distribution with studies in other countries reported elsewhere (Marvaldi et al., 2021). As far as our knowledge extends, few studies have focused on PTSD measures in HCWs in LMCI. Even a smaller number of brief reports and studies have specifically focused in Latin American countries (Rosales Vaca et al., 2022; Villalba-Arias et al., 2020). A study published by Zuñiga et al. (2021) in four Latin American countries in health professionals evaluated PTSD symptoms with a similar prevalence (19.9%) compared to the point prevalence we are reporting in Colombia (18.68%).

During the first coronavirus outbreak (SARS), members in a hospital in Taiwan reported a 13% of anxiety symptoms (Bai et al., 2004). Also, in the MERS outbreak, hospital practitioners reported 11% of anxiety symptoms measured with the Hospital Anxiety and Depression Scale (Lee et al., 2018). A pooled prevalence of 23.21% (95% CI, 17.7–29.13, $p < 0.001$) of anxiety symptoms in HCWs was reported after a year of the COVID – 19 Pandemic (Pappa et al., 2020). Moreover, a recent meta-analysis with larger sample sizes ($n = 271.319$) reported a 42% prevalence of anxiety symptoms (95% CI, 35–48, $p < 0.001$) in HCWs during the same period of time (Aymerich et al., 2022). It is possible that the differences between the studies in the pooled prevalence are associated with a higher number of studies involved in the Aymerich et al. publication and the period of time evaluated. Furthermore, in a sample of 531 general practitioners in Colombia, researchers reported a 39.3% of anxiety symptoms

measured with the GAD-7 scale (Monterrosa-Castro et al., 2020). Our results (43.19%) are aligned with both a recent published meta-analysis as well as with the Colombian 2020 report of anxiety symptoms in a subgroup of HCWs reporting higher prevalence during COVID-19. In synthesis, our findings support a higher prevalence of anxiety symptoms in this limited population of HCWs in the northern region of Colombia, proportional and comparable with other point prevalence reported worldwide. Additionally, it is possible that these results correlate with the higher incidence of new cases and deaths tolls during this specific period of assessments in cities selected for this study during the COVID - 19 pandemic. We should highlight that both Barranquilla and Valledupar had their healthcare systems overwhelmed during the second wave of this pandemic. This issue should also be addressed as another variable in specific cities and regions elsewhere when measuring worst, the physical and mental health outcomes in HCWs.

Depressive symptoms have been described previously in HCWs as one of the main mental health problem associated during work-related experiences (De Boer et al., 2011). In a meta-analysis across 65 studies involving 97.333 HCWs across 21 countries, a pooled prevalence of depressive symptoms was estimated in 21.7% (95% CI, 18.3–25.2) (Li et al., 2021). At the beginning of the COVID-19 pandemic, Pappa et al. (2020) estimated the prevalence of depression with a reduce sample of studies ($n = 13$) in 22.8%, with similar proportions to the Li et al. (2021) study which had a larger sample of studies included ($n = 65$). Our results have a higher prevalence of depressive symptoms of 26.85% compared to the results in the previous meta-analyses (Li et al., 2021). In Colombia, a cross-sectional study in Medellin with a sample of 1.247 HCWs reported a prevalence 14.6% of depression symptoms (Restrepo-Martínez et al., 2021). However, this study was performed in the andinan region of the country. Hence, significant differences between prevalence of self-reported mental symptoms among specific Colombian regions have been reported previously in the 2015 National Mental Health Survey (Gómez-Restrepo et al., 2016). This might be responsible for the difference reported between the study published by Restrepo-Martínez et al. and our findings. In addition, we reported differences in the media score (3, IQR: 7–1) of the PHQ-9 tool compared to another study in HCWs also performed in the northern region of Colombia (1, IQR: 0–4) (Campo-Arias et al., 2021). At the end, such differences can be related to the time of data collection and the period of the full blown the COVID – 19 pandemic in our country.

Our second main goal during this cross-sectional survey-based study was to be able to identify associated factors for poorer mental health outcomes of stress, anxiety, and depressive symptoms in HCWs. Previous studies have reported a positive association with demographic factors such as age, gender, education, and socioeconomic status among others with mental disorders (Benjet et al., 2016; Bromet et al., 2011; Kessler & Wang, 2008; Kessler et al., 1995, 2005, 2010; Seedat et al., 2009). As expected, our results showed that HCWs in the frontline during the SARS-CoV-2 outbreak reported more PTSD and depressive symptoms. Moreover, a stronger association was reported in the regression model for probable PTSD and depression symptoms specifically in frontline HCWs. Previous studies have reported similar results on poor mental health outcomes in frontline HCWs during the COVID-19 pandemic (Di Tella et al., 2020; Lai et al., 2020). Potential stressful life events and work-related situations may increase the risk for disease. Clinical stress usually arises when one perceives that events might exceed a person's adaptive capacity (Cohen & Janicki-Deverts, 2012; Cohen et al., 2007; Lazarus & Folkman, 1984). Thus, such a thing has happened in widened proportions during this COVID – 19 pandemic around the planet. Not surprisingly, OHPs reported a strong association with probable PTSD and anxiety symptoms in our model, while those HCWs with a previous infection only showed a strong association with PTSD symptom but not for depressive symptoms. In this sense, physiotherapists who

were responsible of collecting the nasal swab samples in high risk populations and serial nasal swabs in clinically confirmed COVID patients in hospital wards and/or in the ICUs might be severely affected with regards to anxiety and PTSD symptoms. As a consequence, levels of fear and stress in others subgroup of HCWs may be even higher than those reported in frontline HCWs in the ER and ICU. In fact, other chronic stress responses associated with a possible long-COVID infection or complicated convalescence periods as well as the uncertainty about the long-term functional consequences of COVID infection itself (Del Rio et al., 2020). Therefore, more prospective studies must be conducted to elucidate this association upon data available on subsequent waves of the COVID – 19 pandemic both in Latin-America and worldwide.

PTSD is considered a severe mental health condition in which symptom severity might be determined according to severity of trauma exposure (Watson, 2019; Yehuda et al., 2015). As a rule infectious outbreaks or pandemics are limited in time. However, the mental outcomes associated with an outbreak or pandemic could continue to endure during the lifespan. Further down the line, evolving chronicity and negative consequences in social, familiar, and work-life impairment may also emerged. As far as we know, this is the first study to report on PTSD symptoms as a mental health outcome in HCWs in Colombia. Hence, results related to PTSD symptoms are an important issue for public mental health policies and multimodal interventions during the remaining of the present COVID-10 resurgence and the post-COVID-19 era coming soon. In this sense, novel findings on stress psychopathology must become the mainstream over which prevention and promotion programs in health institutions should be tailor to mitigate the onset of PTSD symptoms in HCWs.

There are several implications can be drawn from these mental health outcomes for HCWs in LMICs. First of all, the increasing importance and relevance of including mental health psychometric measures in at-risk populations such as HCWs exposed to stressful environments. Stress exposure is a potential occupational mental health hazard for HCWs that needs to get the needed attention from policymakers, employers, and healthcare providers in LMICs and Latin-America. There is an urgent need to develop novel psychosocial interventions and promptly design safety and health programs associated with these specific occupational hazards in order to guarantee both physical and mental wellness of HCWs (Gold et al., 2022). The second implication we drew is about the association between previous COVID-19 infection and mental health outcomes in HCWs. In fact, several reports mental health outcomes with the long-COVID syndrome are available (Anaya et al., 2021; Crook et al., 2021; Del Rio et al., 2020; Heneka et al., 2020). However, this issue needs special attention focused on subgroup analyses between the HCWs and COVID-survivors. In this sense, we hope to be able to draw some statistical differences in post hoc analyses for our HCWs and COVID - 19 survivors' data set for the northern region of Colombia. Finally, our third implication was related to the possible differences on mental health outcomes among HCWs in high and low-and middle-income countries during infectious outbreaks or pandemics. At present, environmental issues such as lack of sufficient protective equipment, work-overload, and the lack of psychosocial support for HCWs, generate a need to develop new effective strategies, working policies, and a correct treatment agenda that may guarantee physical, mental, and psychosocial health in HCWs.

4.1. Limitations

The following limitations were identified in the study. First, related to the study design to rule causality. More analytical and prospective studies controlling for confounding bias are needed to explore the hypothesis regarding the associated factors identified and the poorly mental health outcomes derived from our findings.

Second, the self-administered questionnaires to assess mental health domains may be inaccurate due to respondent and recall bias. However, several studies indicate that self-administered tools and face-to-face interviews provide similar estimates for the mental health outcomes assessed (Tsakos et al., 2008). Third, selection bias can also be introduced with a convenience sample in a specific region of the country. However, our findings might give a plausible exploratory hypothesis of the distribution of PTSD, anxiety and depressive symptoms for HCWs in the northern region of Colombia. Again, one should be cautious in trying to extrapolate the findings to other settings.

5. Conclusion

To summarize, our findings reported a higher prevalence of PTSD, anxiety, and depressive symptoms for a subgroup of HCWs located in the northern region of Colombia. We also described the distribution of the mental health outcomes within a subgroup comparison analyses in at-risk population of HCWs in a LMIC. Additionally, we also reported on three specific associated factors with poor mental health outcomes such as (1) been involved in treating patients with SARS-CoV2 infection; (2) having been infected by SARS-CoV2 in the past 12 months and/or (3) being OHPs such as physiotherapist, which seemed to be overrepresented in this survey sample. From now on, mental health staff and attending psychiatrist, should be considered these as strong factors associated with PTSD, anxiety and depressive symptoms in our Colombian sample of HCWs. These results will help to improve and tailor novel mental health interventions both inside and outside the hospitals. We also hope to be able to build effective clinical guidelines for HCWs and psychosocial support groups such as COVID – 19 survivors' and HCWs associations in Colombia and other LMICs. With progressive climate change and future upcoming pandemics this issue has to become a priority for clinical psychiatry, policy makers and mental health researchers. It is known that during outbreaks such as the COVID-19 pandemic, a late response to work-related stressful situations in HCWs may be associated with early or rapid development of mental health symptoms and a possible risk of chronicity. Therefore, it is a must to provide evidence-based interventions for PTSD, anxiety, and depressive symptoms within a newly developed multi-disciplinary team effort and approach including emerging data available from an evolving pandemic in modern times. These newly integrated programs should help mitigate negative outcomes in physical, mental and psychosocial domains for HCWs.

Data statement

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

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Ethics

We further confirm that any aspect of the work covered in this manuscript that has involved human patients has been conducted with the ethical approval of all relevant bodies and that such approvals are acknowledged within the manuscript. IRB approval was obtained from Universidad Simon Bolivar.

Authors' contribution

H.F.G.B: provided the conception, design of the study, analysis and interpretation of data, drafting the article, revised it critically for important intellectual content, and final approval of the version to be submitted; K.A.V: acquisition of data; M.P.F: acquisition of data; D.M: revised it critically for important intellectual content; A.D: revised it critically for important intellectual content; S.S: revised it critically for important intellectual content; M.P.S: revised it critically for important intellectual content; P.M: acquisition of data; R.T: acquisition of data; J.T: acquisition of data; S.S: revised it critically for important intellectual content; J.E: revised it critically for important intellectual content; A.P: revised it critically for important intellectual content; S.M: revised it critically for important intellectual content; J. E: revised it critically for important intellectual content; C.M: revised it critically for important intellectual content; R.M: revised it critically for important intellectual content; J.G.U: acquisition of data and revised it critically for important intellectual content; N.A: acquisition of data; J.F.G.F: analysis and interpretation of data, drafting the article, revised it critically for important intellectual content, and final approval of the version to be submitted.

Declaration of Competing Interest

All authors have no conflict of interest to report.

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