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Four-month incidence of suicidal thoughts and behaviors among healthcare workers after the first wave of the Spain COVID-19 pandemic

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ABSTRACT

Healthcare workers (HCW) are at high risk for suicide, yet little is known about the onset of suicidal thoughts and behaviors (STB) in this important segment of the population in conjunction with the COVID-19 pandemic. We conducted a multicenter, prospective cohort study of Spanish HCW active during the COVID-9 pandemic. A total of n = 4809 HCW participated at baseline (May–September 2020; i.e., just after the first wave of the pandemic) and at a four-month follow-up assessment (October–December 2020) using web-based surveys. Logistic regression assessed the individual- and population-level associations of separate proximal (pandemic) risk factors with four-month STB incidence (i.e., 30-day STB among HCW negative for 30-day STB at baseline), each time adjusting for distal (pre-pandemic) factors. STB incidence was estimated at 4.2% (SE = 0.5; n = 1 suicide attempt). Adjusted for distal factors, proximal risk factors most strongly associated with STB incidence were various sources of interpersonal stress (scaled 0–4; odds ratio [OR] range = 1.23–1.57) followed by personal health-related stress and stress related to the health of loved ones (scaled 0–4; OR range 1.30–1.32), and the perceived lack of healthcare center preparedness (scaled 0–4; OR = 1.34). Population-attributable risk proportions for these proximal risk factors were in the range 45.3–57.6%. Other significant risk factors were financial stressors (OR range 1.26–1.81), isolation/quarantine due to COVID-19 (OR = 1.53) and having changed to a specific COVID-19 related work location (OR = 1.72). Among other interventions, our findings call for healthcare systems to implement adequate conflict communication and resolution strategies and to improve family-work balance embedded in organizational justice strategies.

1. Introduction

The COVID-19 pandemic has presented healthcare workers (HCW) with unprecedented challenges. High prevalence of adverse mental health among HCW active during the pandemic is therefore to be expected (De Kock et al., 2021; Sun et al., 2021; Uphoff et al., 2021) although it is unclear to what extent mental health among HCWs is different from workers in other high-pressure occupations (Harvey et al., 2021). Pre-pandemic studies showed consistently that both physicians (Dutheil et al., 2019) and nurses (Davis et al., 2021) are at high risk for suicide compared to other employed people (Milner et al., 2013), in part related to high access to lethal means and low willingness to seek help (Harvey et al., 2021). Studies carried out during the pandemic found high levels of suicidality among HCW (Greenberg et al., 2020; Mediavilla et al., 2021; Mortier et al., 2021a; Murata et al., 2021; Sahimi et al., 2021; Xiaoming et al., 2020; Xu et al., 2021; Zhou et al., 2020). However, prospective data on incidence of and risk factors for suicidal thoughts and behaviors (STB) are lacking (Eyles et al., 2021).

Spain was among those countries whose healthcare systems came under extreme pressure during the first wave of the COVID-19 pandemic (March–July 2020; Arango, 2020). The present study aims to (1) estimate four-month STB incidence among Spanish HCW active during the first wave of the Spain COVID-19 pandemic; and (2) investigate individual-and population-level associations of a wide range of potential risk factors with STB incidence.

2. Material and methods

2.1. Study design, population, and sampling

The study design consists of a multicenter, prospective, observational cohort study of Spanish HCW, representing eighteen Spanish healthcare institutions (hospitals, primary care, and public healthcare centers)(MINDCOVID, 2020). The cohort was assessed at baseline (May 5th through September 7th, 2020, i.e., just after the height of the first wave of the Spain COVID-19 pandemic) and at four months follow-up (October 9th through December 11th, 2020, at the height of the pandemic's second wave; mean = 120.1 days [SD = 22.2]) using web-based self-report surveys. Cumulative COVID-19-related death in Spain was 28,445 during the first wave of the pandemic (March–July 2020). During the study's baseline and follow-up assessment this was 4088 and 14,936, respectively (Roser et al., 2022).

Recruitment for the baseline survey consisted of healthcare representatives contacting all employed HCW in each participating healthcare center using administrative email distribution lists (i.e., census sampling). A total of n = 8996 HCW participated (response rate = 11.7%) and of those, n = 4809 (65.7%) participated in the follow-up survey. For both surveys, two reminder emails were sent within 2–4 weeks after the initial invitation.

Informed consent was obtained from all participants. The study complies with the principles established by national and international regulations, including the Declaration of Helsinki and the Code of Ethics. The study was approved by the Research Integrity and Good Scientific Practices Committee of IMIM-Parc de Salut Mar, Barcelona, Spain (2020/9203/I), and by all participating centers' institutional review boards (IRBs).

2.2. Measures

A modified version of selected items from the Columbia Suicide Severity Rating Scale (Posner et al., 2011) assessed STB in the 30 days previous to the baseline and follow-up surveys, including dichotomous questions about passive suicidal ideation (SI), active SI, suicide plans and suicide attempts (SA). A dichotomy for "any STB" (i.e., having any

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of the four STB outcomes) was created as the outcome.

We considered ten distal (i.e., pre-pandemic) risk factors, assessed in the baseline survey: age; gender; country of birth; marital status; pre-pandemic monthly income level; having children in care; type of profession; type of workplace; pre-pandemic lifetime mental disorders assessed using a checklist based on the Composite International Diagnostic Interview (CIDI; Kessler and Üstün, 2004) that screens for lifetime mood, anxiety, substance use problems, and 'other mental disorders'; and pre-pandemic physical health conditions, assessed using a 7-item check-list (Sangha et al., 2003) for respiratory diseases, cardiovascular diseases, diabetes, cancer, chronic hepatic diseases, immunological diseases and 'other diseases'.

Five proximal (pandemic) risk factor domains were included, assessed in the baseline survey: (1) factors directly related to COVID-19 infection, i.e., having been hospitalized for COVID-19 infection or having had a positive COVID-19 test or medical diagnosis not requiring hospitalization; having been isolated or quarantined because of exposure to COVID-19 infected person(s); and having close ones infected with COVID-19; (2) work-related factors, i.e., the frequency of direct exposure to COVID-19 infected patients during professional activity (using a 5-level Likert type scale); the perceived lack of healthcare center preparedness (i.e., 0–4 summary score of four 5-level Likert type scales that assessed lack of coordination, communication, personnel, and supervision at work, respectively); the average weekly hours worked; changes in assigned functions, team, or working location; the perceived frequency of lack of protective equipment (5-level Likert scale); having to make decisions regarding prioritizing care among COVID-19 patients; and having patients in care that died from COVID-19 (3) health-related stress, i.e., personal health-related stress (i.e., 0–4 summary score of two 5-level Likert type scales that assessed stress related to the respondent possibly being infected with COVID-19 and stress related to the respondents' health in general); and stress related to the health of loved ones (i.e., 0–4 summary score of two 5-level Likert type scales that assessed stress related to the loved ones possibly being infected with COVID-19 and stress related to loved ones' health in general); (4) financial factors, i.e., having suffered a significant loss in personal or family income due to the COVID-19 pandemic; and financial stress (i.e., a 0–4 summary score of two 5-level Likert type scales that assessed stress related to the respondent's financial situation and stress related to job loss or loss of income because of COVID-19); (5) interpersonal stress, i.e., stress related to love life and stress related to problems getting along with people at work (using 5-level Likert type scales); family functioning assessed using the Brief Assessment of Family Functioning Scale (Mansfield et al., 2019), a 3-item version of the general functioning scale from the Family Assessment Device (Epstein et al., 1983); and parental stress assessed using a 4-item version of the Parental Stress Scale (Berry and Jones, 1995).

2.3. Statistical analysis

Non-response and attrition bias were tackled by calculating sample weights through a raking and inverse probability weighting procedure that matches the final sample (n = 4809) to (1) the target population of Spanish HCW (n = 103,578) according to healthcare center, and according to gender, age, and professional category (overall and within each healthcare center); and (2) the full sample of baseline participants (n = 8996) according to all baseline survey variables. Multivariable imputation by chained equations with 12 imputed datasets and 10 iterations per imputation was used to address the minimal problem of item-level missing data.

Four-month STB incidence was defined as the proportion of respondents reporting any 30-day STB at four-month follow-up among those without any 30-day STB at baseline. This is reported as a weighted percentage with associated standard error (SE). Logistic regression was used to estimate the associations between risk factors and STB incidence. Results are reported as odds-ratios with 95% confidence intervals (OR [95%CI]). We estimated individual-level associations of each distal risk factor with STB incidence as well as a multivariable model including all distal risk factors. We then estimated individual- and population-level associations of each separate proximal risk factor with STB incidence, each time adjusting for all distal risk factors. Since causal relationships between the included proximal risk factors are largely unknown, we refrained from constructing a fully adjusted multivariable model to avoid the risk of overadjustment bias (Schisterman et al., 2009). All analyses adjusted for healthcare center membership and time of survey. Population-level associations, i.e., population attributable risk proportions (PARP) (Krysinska and Martin, 2009) and their standard errors (SE) were calculated using simulation methods based on the logistic regression equations. PARP is the proportion of the cumulative predicted value of an outcome statistically explained by specific predictor variables. PARP can be interpreted as the expected proportional reduction in STB incidence if the risk factors or the causal factors accounting for the risk factors were eradicated in the population. It is important to note that PARPs can sum to more than 100% because some individuals with more than one risk factor can have STB prevented in more than one way, and the prevented STB cases of these individuals could be counted more than once (Rowe et al., 2004).

3. Results

Of the 4809 HCW included in the sample, 4412 HCW did not report any 30-day STB in the baseline survey. Of those, 182 HCW reported 30-day STB in the follow-up survey, representing an estimated weighted four-month STB incidence of 4.2% (SE = 0.5). The majority (n = 132; 71.9%[SE = 3.4]) had only passive SI, a much smaller number (n = 22; (14.4%[SE = 3.8]) had active SI (with or without passive SI), and the remainder either planned a SA (n = 28; 13.2%[SE = 2.9]) or made a SA (n = 1). Sample characteristics are shown in Table 1, left panel. Of the n = 397 HCW that did report STB at baseline, n = 199 also reported STB at four-month follow-up, representing an estimated weighted STB persistence of 52.5% (SE = 3.3). Lack of statistical power precluded further analysis of STB persistence, and in the remainder of the current report we uniquely focus on STB incidence.

Distal risk factors significantly associated with STB incidence (Table 1) were pre-pandemic lifetime mental disorders (OR range 1.59–2.53), being an auxiliary nurse (OR = 2.07), being single, divorced, legally separated, or widowed (OR = 1.72). Having a pre-pandemic monthly income level higher than 2200€ was a protective factor (OR range 0.49–0.53). These associations remained generally consistent in the multivariate model that simultaneously considered all distal risk factors.

Adjusted associations of proximal risk factors with STB incidence are shown in Table 2. Interpersonal stress was most strongly associated with STB incidence, both on the individual-level (OR range = 1.23–1.57) and the population-level (PARP = 57.6%). This was followed by personal health-related stress and stress related to the health of loved ones (OR range 1.30–1.32; PARP = 50.9%), and by the perceived lack of preparedness of the healthcare center (OR = 1.34; PARP = 45.3%). Other significantly associated risk factors were financial factors (OR range 1.26–1.81; PARP = 25.0%), having been isolated or quarantined for

Table 1
Associations of distal (pre-pandemic) risk factors with four-month STB incidence (n = 4412).

			Incidence Any STB	
Distal (pre-pandemic) risk factor	n[a]	% (SE)[a]	OR (95% CI)[b]	OR (95% CI)[c]
Age				
- 50 years or more	1866	43.5 (2.4)	1.32 (0.75–2.32)	1.87 (0.83–4.19)
- 30–49 years	2110	46.2 (1.7)	1.39 (0.77–2.50)	1.80 (0.87–3.71)
- 18–29 years	436	10.3 (1.6)	(ref)	(ref)
Gender				
- Female	3573	77.5 (1.4)	0.91 (0.56–1.49)	0.86 (0.50–1.48)
- Male	839	22.5 (1.4)	(ref)	(ref)
Country of birth				
- Other	201	4.2 (0.5)	0.69 (0.20–2.31)	0.70 (0.20–2.50)
- Spain	4211	95.8 (0.5)	(ref)	(ref)
Marital status				
- Single, divorced, legally separated, or widowed	2039	46.1 (2.1)	1.72 (1.12–2.65)*	1.56 (0.91–2.66)
- Married	2373	53.9 (2.1)	(ref)	(ref)
Pre-pandemic monthly income				
- More than 4500€	1554	29.5 (1.5)	0.53 (0.37–0.77)*	0.70 (0.45–1.10)
- Between 2200€ - 4500€	1598	36.7 (1.2)	0.49 (0.33–0.74)*	0.59 (0.39–0.89)*
- Less than 2200€	1260	33.8 (2.1)	(ref)	(ref)
Having children in care				
- Yes	1870	42.2 (1.2)	0.83 (0.56–1.21)	0.95 (0.64–1.39)
- No	2542	57.8 (1.2)	(ref)	(ref)
Profession				
- Medical doctor	1518	26.6 (3.0)	0.95 (0.59–1.52)	1.25 (0.73–2.15)
- Nurse	1296	31.5 (1.4)	0.87 (0.51–1.48)	1.02 (0.61–1.71)
- Auxiliary nurse	349	13.1 (3.1)	2.07 (1.01–4.26)*	1.96 (1.01–3.80)*
- Other profession involved in patient care	509	9.0 (0.9)	1.83 (0.91–3.71)	2.12 (1.15–3.92)*
- Other profession not involved in patient care	740	19.8 (2.3)	(ref)	(ref)
Workplace				
- Other	376	6.4 (0.5)	0.45 (0.20–1.01)	0.43 (0.18–1.05)
- Primary Care	1441	35.9 (0.9)	1.15 (0.73–1.83)	1.38 (0.85–2.25)
- Hospital	2595	57.7 (0.9)	(ref)	(ref)
Number of pre-pandemic lifetime mental disorders				
- Two or more	279	6.9 (0.7)	2.53 (1.20–5.33)*	2.18 (1.09–4.38)*
- Exactly one	1396	31.8 (0.9)	1.59 (1.21–2.07)*	1.57 (1.20–2.05)*
- None	2737	61.3 (0.8)	(ref)	(ref)
Number of physical health conditions				
- Two or more	136	3.7 (0.5)	1.16 (0.39–3.40)	1.08 (0.38–3.06)
- Exactly one	917	21.8 (0.7)	1.38 (0.93–2.05)	1.32 (0.88–1.98)
- None	3360	74.5 (1.0)	(ref)	(ref)

Abbreviations: OR = odds ratio; CI = confidence interval; SE = standard error; STB = suicidal thoughts and behaviors.
* Indicate statistically significant results (α = 0.05).
[a] Number of observations (n) are unweighted; proportions (%, SE) are weighted.
[b] Each row represents a separate logistic regression model, each time adjusting for healthcare center membership and time of survey.
[c] Results represent one logistic regression model including all distal risk factors, additionally adjusting for healthcare center membership and time of survey.

Table 2
Associations of proximal (pandemic) risk factors with four-month STB incidence (n = 4412).

			Incidence Any STB	
Proximal (pandemic) risk factor	n[a]	% (SE) or Med (SE) (IQR)[a]	OR (95% CI)[b]	PARP (SE)[b]
A. Infection-related factors				
Personal COVID-19 infection				
- having been hospitalized for COVID-19	59	1.3 (0.2)	0.23 (0.04–1.17)	7.0 (4.6)
- positive COVID-19 test or medical COVID-19 diagnosis	780	15.7 (2.1)	1.50 (0.93–2.40)	
- none of the above	3574	83.0 (2.2)	(ref)	
COVID-19 infection loved ones				
- partner, children, or parents	712	13.5 (2.0)	1.00 (0.67–1.50)	−1.2 (17.5)
- other family, friends or others	2726	58.9 (1.0)	0.98 (0.64–1.51)	
- none of the above	974	27.6 (2.5)	(ref)	
Having been isolated or quarantined because of COVID-19	1209	25.2 (1.5)	1.53 (1.05–2.22)*	11.9 (5.9)*
Risk domain A. - total PARP[c]				10.2 (16.3)
B. Work-related factors				
Frequency of direct exposure to COVID-19 patients (scale 0–4)[d]		1.8 (0.2) (0.9–2.8)	1.08 (0.97–1.20)	14.7 (15.1)
Perceived lack of healthcare center preparedness (scale 0–4)[d]		1.5 (0.1) (0.7–2.3)	1.34 (1.09–1.64)*	45.3 (13.2)*
Average weekly hours worked				
- 51 h or more	687	14.0 (0.7)	1.50 (0.78–2.91)	9.2 (7.3)
- 41–50 h	1052	22.8 (2.5)	1.15 (0.73–1.82)	
- 40 h or less	2673	63.2 (2.6)	(ref)	
Changes in assigned functions, team, or working location				
- changed to specific COVID-19 related work location	982	20.7 (3.5)	1.72 (1.18–2.52)*	11.9 (10.1)
- changed of team or assigned functions	1492	33.3 (3.1)	1.01 (0.69–1.46)	
- no changes	1939	45.9 (1.6)	(ref)	
Perceived frequency of lack of protective equipment (scale 0–4)[d]		1.7 (0.1) (1.0–2.5)	1.16 (0.93–1.45)	26.7 (14.8)
Having to make decisions regarding prioritizing care among COVID-19 patients	812	15.8 (1.9)	1.21 (0.60–2.44)	3.2 (4.1)
Having patient(s) in care that died from COVID-19 infection	1757	37.1 (3.2)	0.82 (0.55–1.21)	−7.3 (8.1)
Risk domain B. - total PARP[c]				49.0 (16.4)*
C. Health-related stress				
Personal health-related stress (scale 0–4)[d]		1.5 (0.1) (0.7–2.4)	1.32 (1.08–1.63)*	43.4 (12.3)*
Health-related stress loved ones (scale 0–4)[d]		2.4 (0.1) (1.5–3.2)	1.30 (1.04–1.63)*	51.1 (17.5)*
Risk domain C. - total PARP[c]				50.9 (17.5)*
D. Financial factors				
Significant loss of personal or family income due to COVID-19	799	19.8 (1.1)	1.81 (1.27–2.56)*	11.6 (4.8)*
Financial stress (scale 0–4)[d]		0.6 (0.0) (0.0–1.5)	1.26 (1.11–1.43)*	24.8 (8.6)*
Risk domain D. - total PARP[c]				25.0 (8.5)*
E. Interpersonal stress				
Stress related to getting along with people at work (scale 0–4)[d]		0.4 (0.0) (0.0–1.4)	1.29 (1.12–1.48)*	26.0 (7.6)*
Stress related to love life (scale 0–4)[d]		0.9 (0.0) (0.0–2.0)	1.23 (1.07–1.42)*	26.9 (9.4)*
Family malfunctioning (scale 0–4)[d]		0.3 (0.0) (0.0–0.9)	1.57 (1.20–2.05)*	34.5 (9.4)*
Parental stress (scale 0–4)[d]		0.0 (0.0) (0.0–0.8)	1.28 (1.02–1.60)*	12.8 (6.4)*
Risk domain E. - total PARP[c]				57.6 (8.3)*

Abbreviations: OR = odds ratio; CI = confidence interval; PARP=Population Attributable Risk Proportion; IQR = interquartile range; Med = median; SE = standard error; STB = suicidal thoughts and behaviours.

* Indicate statistically significant results (α = 0.05).

[a] Number of observations (n) are unweighted; proportions (%, SE) and medians (Med, IQR) are weighted.

[b] Each row represents a separate logistic regression model, each time adjusting for all distal risk factors and time of survey.

[c] Risk domain total PARPs are based on five separate logistic regression models, one for each of the five proximal risk factor domains. Each model includes the proximal risk factors from the corresponding proximal risk factor domain (but not the other domains), adjusting for all distal risk factors and time of survey.

[d] The OR indicates the increase in odds per one unit change across the 0–4 scale. We provide an illustrative example for the interpretation of the OR derived from the models including 0–4 scale proximal risk factors: the OR of 1.08 for the association between "Direct exposure to COVID-19 patients" and STB incidence represents an increase in OR of $1.08^4 = 1.36$ between having a minimum score of 0 versus a maximum score of 4 on the 0–4 scale. Please see Supplementary Table 1 for analyses including proximal risk factors dichotomized at different cut-off values across the 0–4 scale (3–4 vs 0–2; 2–4 vs 0–1).

COVID-19 (OR = 1.53; PARP = 11.9%), and having changed to a specific COVID-19 related work location (OR = 1.72).

4. Discussion

Incidence of STB among Spanish HCW four months after the height of the first wave of the COVID-19 pandemic is estimated at 4.2%. Although around 70% of incident cases reported passive SI only, it should be noted that a recent meta-analysis (Liu et al., 2020) found that passive SI is clinically very similar to active SI, as it is highly correlated to the presence of mental disorders, psychological factors related to suicide, SA, and even suicide deaths. In addition, passive SI may also function as a prodromal marker of risk for future adverse mental health (Liu et al., 2020). A lack of previous studies precludes comparison of our incidence figure with HCW populations from other countries. Prevalence estimates of HCW SI during the pandemic are in the range

4.4–13% (Greenberg et al., 2020; Mediavilla et al., 2021; Mortier et al., 2021a; Murata et al., 2021; Sahimi et al., 2021; Xiaoming et al., 2020; Xu et al., 2021; Zhou et al., 2020), while population estimates range from 4.5% in Spain (Mortier et al., 2021b) to 4.6–18.0% in other countries (Ammerman et al., 2021; Bryan et al., 2020; Czeisler et al., 2020; Fitzpatrick et al., 2020; Gratz et al., 2020; Iob et al., 2020; O'Connor et al., 2020; Winkler et al., 2020). Pre-pandemic studies found a pooled past month prevalence of passive SI in the general population of 3.8% (Liu et al., 2020); in the pre-pandemic Spanish population, 12-month STB prevalence is 0.7–0.9% (Miret et al., 2014). Taken together, this suggests that our incidence figure should be considered on the high side. Further monitoring of our HCW cohort is therefore warranted.

Important STB risk factors that our study identified include low hospital preparedness, health-related stress, loss of income and financial stress, having been isolated or quarantined for COVID-19, being an auxiliary nurse (or any other profession involved in patient care apart from nurses and medical doctors), pre-pandemic lifetime mental disorders, and having a lower income. This confirms some of the earlier findings from cross-sectional studies on pandemic-related adverse mental health (Eyles et al., 2021; Uphoff et al., 2021) and now shows that these specific risk factors are all prospectively associated with onset of STB shortly after the initial COVID-19 outbreak. Of note, our study did not find evidence for increased risk for STB incidence among those hospitalized for COVID-19, those HCW having to prioritize care among COVID-19 patients or those that had patients die from COVID-19. Perhaps the most important finding of our study is that up to 60% of incident SI is attributed to a broad array of interpersonal stress (like workplace interpersonal conflict, stress related to love life, family functioning or parenting). Future studies should investigate potential underlying mechanisms that explain this finding, which could range from exacerbation of pre-pandemic conflict (Rocha and Correa, 2020; e.g., due to increased workload), over loss of connectedness (Courtet et al., 2020; Costanza et al., 2018; e.g., due to COVID-related isolation or loss of significant others) to increased substance use (Wasserman et al., 2020; Costanza et al., 2021a) or financial problems (Costanza et al., 2021b) provoked by the pandemic.

Two limitations of our study are worth mentioning. First, our operationalization of four-month STB incidence is hampered as the time frames of baseline and follow-up STB assessment only span the past 30 days. Incident cases may therefore include reactivation of STB experienced earlier, and we may have missed incident cases in the 3 months after the baseline assessment. There is a general lack of studies on short-term (e.g., month-to-month) patterns of SI to further aid interpret our findings. SI may represent a relatively stable condition with over a third of baseline ideators still reporting SI at two- and ten-year follow-up (Borges et al., 2008; Kivelä et al., 2019; Ten Have et al., 2009). Given the high STB persistence our study suggests (52.5%), future studies with sufficient statistical power should investigate this important outcome in detail. Second, baseline participation in our study was low, but in line with the pooled response rate of 13.0% among HCW web-based surveys worldwide (Cho et al., 2013). Strategies to improve representativeness included census sampling (compared to the frequently used convenience sampling in COVID-19 mental health research (Santomauro et al., 2021) and state-of-the art missing data handling techniques. It is unclear how participation in our study affects the estimated incidence figure. On the one hand, over-reporting of adverse mental health may occur among high-stress occupations to ventilate job dissatisfaction (Goodwin et al., 2013). On the other hand, HCW with sick leave due to adverse mental health may not have participated in our study, which could have led to underestimation.

Our study underscores the need for healthcare systems to promote the reporting of interpersonal conflicts (Alshammari et al., 2017) and to implement adequate communication and conflict resolution strategies (Jerng et al., 2017) as well as to increase flexibility to facilitate family-work balance embedded in organizational justice strategies. Above all, given the absolute lack of research on effective mental health interventions among HCW (Petrie et al., 2019), our study highlights the need for continued research on STB among HCW, both in pandemic and post-pandemic times.

Author statement

JA, GV, and PM reviewed the literature. JA, GV, PM, MF, EA, VPS, JMH, RCK, and RB conceived and designed the study. EA, JDM, NL, TP, JMPT, JIP, JIE, ME, NP, AGP, CR, EA, ICG, AAP, MC, APZ, EV, CS, and VPS acquired the data. GV, IA, FA, and PM cleaned and analyzed the data. JA, GV, and PM drafted the initial version of the manuscript. All authors reviewed the initial draft and made critical contribution to the interpretation of the data and approved the manuscript. The corresponding author attests that all listed authors meet authorship criteria and that no others meeting the criteria have been omitted.

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Data availability

The de-identified participant data as well as the study protocol, statistical analysis plan and data dictionaries used for this study are available as from publication and upon reasonable request from the corresponding author (PM; pmortier@imim.es) as long as the main objective of the data-sharing request is replicating the analysis and findings as reported in this paper (without investigator support), after approval of a proposal and with a signed data access agreement.

Declaration of interest

EA reports personal fees from Lündbeck, Esteve, Schwabe and Roche. EV reports personal fees from Abbott, Allergan, Angelini, Lundbeck, Sage and Sanofi, grants from Novartis and Ferrer, and grants and personal fees from Janssen, outside the submitted work. JDM reports personal fees from Janssen and Angelini, personal fees and non-financial support from Otsuka, Lundbeck and Accord, outside the submitted work. JMPT reports personal fees from Angelini, Janssen and Lunbeck, and grants from Janssen, outside the submitted work. RCK was a consultant for Datastat, Inc., Holmusk, RallyPoint Networks,Inc., and Sage Therapeutics. All other authors reported no conflict of interest.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.jpsychires.2022.02.009.

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