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Trauma and stressor-related disorders among health care workers during COVID-19 pandemic and the role of the gender: A prospective longitudinal survey.

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A B S T R A C T

Introduction: Health-care Workers (HCW) are facing a critical situation caused by Coronavirus Disease 2019 (COVID-19) which could impact on their mental health status. In addition, HCW women have been identified as a group at high-risk of developing psychological distress, although no previous longitudinal studies have explored this issue in a sample of HCW.

Aims: The main aim of the study was to observe the temporal pattern of the stress reactions among HCW as well as to explore its potential predictors of poor outcome. Moreover, we analyzed possible gender differences in stress reaction responses.

Methods: One thousand for hundred and thirty-two HCW responded an online survey including sociodemographic, clinical, and psychometric tests in May 2020 while 251 HCW answered in November 2020. Bivariate and multivariate analyses as well as repeated measures analyses were used to achieve the aims of the study.

Results: The proportion of HCW who fulfilled Acute Stress Disorder criteria did not change over the follow-up period, although we observed a significant improvement in stress reactions responses among HCW. Proximal factors were the most salient predictors of traumatic reactions. Repeated analyses revealed significant gender differences in acute stress reactions. In addition, women showed significantly greater improvement than men in re-experiencing the traumatic event and hyperarousal dimensions.

Conclusions: Monitoring of working conditions as well as emotional reactions in HCW facing major disasters should be carried out to prevent the development of peritraumatic stress reactions. In addition, HCW women are characterized by a different pattern of progression in stress responses.

Introduction

The mental health status of the general population, Health-care Workers (HCW) and mental health users could be adversely compromised by the pandemic caused by Coronavirus Disease 2019 (COVID-19) (Crespo-Facorro, 2020). In fact, it has been suggested that COVID-19 pandemic could trigger the development of long-term mental or physical symptoms which needs to be analyzed (Vieta et al., 2020).

HCW involved in COVID-19 response have been identified as a vulnerable group to suffer psychological consequences (Alonso et al., 2021; Lasalvia et al., 2021). In fact, it has been reported that between 28 and 38% suffered anxiety, 15–36% from depression and 25–46% from sleep problems (Luo et al., 2020; Pappa et al., 2020; Rodriguez-Menéndez et al., 2021; Wu et al., 2021). Moreover, a significant proportion of HCW facing COVID-19 pandemic have experienced discrimination and/or stigmatization which has been demonstrated to impact negatively on the mental health status of HCW (Mediavilla et al., 2021).

Peritraumatic stress reactions, understood as stress-associated behavioral, emotional, cognitive and psychological symptoms that occurred during and immediately following a traumatic event (Agorastos et al., 2013), as well as Acute Stress Disorder (ASD) are frequent responses after traumatic events (Visser et al., 2017). In fact, it has been suggested that the presence of peritraumatic stress reactions and ASD in the early aftermath of a traumatic event could trigger the development of subsequent depressive symptoms and a variety of physical and mental health problems (Garfin et al., 2018). On the other hand, ASD has been identified as the most prevalent mental health diagnosis among HCW

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who are fighting against COVID-19 (Serrano-Ripoll et al., 2020).

In spite of the increasing publication of longitudinal studies that have analyzed psychological impact of COVID-19 on the mental health status of the HCW, no reliable conclusions have been drawn (Dufour et al., 2021; Sasaki et al., 2021). Nevertheless, previous longitudinal studies examining mental health consequences among professionals facing previous major disasters showed a high prevalence of psychological effects among this population (Fullerton et al., 2004).

Most of the cross-sectional studies have consistently revealed that COVID-19 pandemic causes more psychological distress in HCW women (López-Atanes et al., 2021; Luo et al., 2020; Rossi et al., 2020). Nonetheless, to the best of our knowledge, no previous publications have explored possible gender differences in the temporal pattern of psychological consequences of the pandemic caused by COVID-19 among HCW. This issue has been studied in general population showing that women presented more psychological distress than men at the beginning of the COVID-19 pandemic although these gender differences despair over time (Fenollar-Cortés et al., 2021).

Given the low number of longitudinal studies in the examination of the psychological impact of COVID-19 among HCW and the potential impact of early peritraumatic reactions on mental health status across time, we aimed to explore potential changes in stress responses and in the prevalence of ASD over a six-month period (from May 2020 to November 2020) in a sample of HCW. Likewise, we sought to identify potential predictors of poor outcome in traumatic reactions occurred during the observational period. For this purpose, a comprehensive set of baseline and follow-up factors were included in the analyses. Secondly, we endeavored to identify possible gender differences in long-term stress acute responses. We hypothesized a diminishing of peritraumatic reactions over time. On the other hand, we think that women will show a better evolution in stress acute reactions during the observational period.

Materials and methods

Participants were contacted and enlightened about study objectives using Google Forms through e-mail lists and professional WhatsApp. Participants gave their digital informed consent, and all data were anonymized. Surveys were sent in two different timepoints (May 2020 and November 2020). The study was approved by the local ethics committee in accordance with international standards for research ethics (2578-N-20). This study was not funded.

Measures

Sociodemographic information such as gender, age, civil status, province of residence, clinical service in which the people worked, or occupational category were recorded throughout proforma designed for the study. In addition, information regarding mental health was also included in the proforma questionnaire (e.g., history of mental health disorder, stress, anxiety, and depression associated with COVID-19, traumatic experiences over pandemic period) as well as COVID-19 exposure, working conditions, coping strategies during pandemic and COVID-19 risk perception. See Table 1.

Stanford Acute Stress Reaction Questionnaire (SASR-Q) (Cardeña et al., 2000) is formed by 30 items distributed on 5 subscales (dissociation, hyperarousal, reexperiencing the traumatic event, avoidance of reminders of the traumatic event and impact on social functioning). The values are collected using a Likert-type scale (0–5) and yield a sum scores range between 0 and 150. Diagnosis of Acute Stress Disorder (ASD) was made according to DSM-IV-TR criteria (American Psychiatric Association, 2000): a previous traumatic event summed to positive scores in a sum of symptoms. Symptoms are present with answers in the Likert scale of 3 or more. To make the diagnosis, positive answers are required for: 3 of 10 items in dissociative subscale, 1 of 6 in the second, third and fourth subscales, 1 of 2 in the subscale of impact on functioning (Cardeña et al., 2000; Casacchia et al., 2013). Cronbach's alpha value was calculated showed strong internal consistency (Cronbach's α=0.96).

General Health Questionnaire (GHQ-28) (Goldberg and Hillier, 1979) is a self-administered screening scale which assesses 4 subscales in 28 items: a) somatic symptoms, b) anxiety and insomnia, c) social dysfunction, d) severe depression. The items are scored in a Likert-type scale 0–3 and yield a total score. QHQ-28 exhibited overall Cronbach's alpha of 0.93 indicating a high degree of internal consistency.

Statistical analyses

All analyses were carried out with SPSS, version 24 (IBM, 2016). The Wilcoxon Signed Rank Test was used to explore potential significant differences in SASR-Q scores in the two time periods considered in the study. On the other hand, potential change in the proportion of ASD diagnosis from the first point to the second point was explored with the McNemar test.

In order to explore potential baseline predictors of poor evolution of stress reactions as well as the development of ASD diagnosis, multivariate analyses were built. To reduce the number of predictors included in multivariate analyses, potential predictors were included in bivariate analyses. Those which resulted significant in these bivariate analyses were introduced as predictors in multivariate analyses. Spearman correlations were used for continuous variables and mean comparisons using the Mann-Whitney *U test* examined associations of categorical variables with SASR-Q dimensions and total score of the questionnaire. On the other hand, Mann-Whitney U tests and chi-square were used to explore significant differences between those who fulfilled ASD diagnosis at follow-up period and those who do not.

As was noted above, lineal, or binary logistic regression analyses were performed to test the real influence of the independent variables identified in the bivariate analyses. The method used was backward stepwise selection (backward elimination conditional). Removal of the variables included in the analysis was based on the probability of the likelihood-ratio statistic based on conditional parameter estimates. Variance Inflation Factor (VIF) was calculated in each of the multivariate models constructed and there were no VIFs values over 3, thus the assumption of multicollinearity was not violated.

Repeated analyses of variance (ANOVA) adjusted by age and level of COVID-19 exposition (degree to which HCW had direct contact with COVID-19 patients, categorized as "yes" or "no") were carried out to explore gender differences in peritraumatic stress reactions (continuous variables). The Kolmogorov-Smirnov test examined the normality of variables. Sphericity was checked using Mauchly's W test (where assumptions of sphericity were violated, a Greenhouse-Geisser adjustment was applied). Effects of time (longitudinal dimension), group (cross-sectional dimension) and time by group (interaction effect) were examined.

Generalized estimating equation (GEE) analyses were used to estimate the effect of gender on the development of ADS disorder at the second time period. The GEE analyses were set up as binary logistic models with a robust estimator. The model included age and level of COVID-19 exposition as covariates. Predictor and covariates were entered simultaneously into the GEE model.

A significance level of 5% was used for all the above analyses.

Results

Sample characteristics

A total of 1432 participants answered a proforma questionnaire at baseline. From the total people who responded baseline proforma, 251 (17.53%) completed the evaluation 6 months later. Sociodemographic and clinical information are displayed in Table 1. We have not found significant differences regarding age ($U = 141{,}632, p > 0.05$), gender ($X^2 = 5.24, p > 0.05$) or history of mental health ($X^2 = 0.22$, $p > 0.05$) between those who completed follow-up questionnaires and those who did not.

Table 1
Descriptive and bivariate analyses.

	Descriptive analyses	Bivariate analyses Dissociation (follow-up)		Hyperarousal (follow-up)		*Re*-experiencing the traumatic event (follow-up)		Avoiding (follow-up)		Social functioning (follow-up)		Total score (follow-up)		ASD (follow-up)	
		Statistics	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**
Age, mean±SD	44.80± 10.97	*r*=−0.03	0.59	*r*=−0.08	0.16	*r*=−0.07	0.23	*r*=−0.11	0.08	*r*=−0.05	0.35	*r*=−0.07	0.21	*U* = 4817.5	0.18
Gender (female), n (%)	1043 (72.8%)	*U* = 6113.5	0.55	*U* = 6134.5	0.59	*U* = 6324.5	0.85	*U* = 5848	0.24	*U* = 5789	0.14	*U* = 5965	0.38	X^2=5.16	0.08
Civil status (married), n (%)	984 (68.7%)	*U* = 4866	0.98	*U* = 4658	0.62	*U* = 4423	0.26	*U* = 4731	0.73	*U* = 4752.5	0.75	*U* = 4680	0.66	X^2=0.01	0.91
History of mental health diagnosis (yes), n (%)	221 (15.7%)	*U* = 3790.5	0.29	*U* = 3807.5	0.33	*U* = 3646.5	0.13	*U* = 3871	0.39	*U* = 4072.5	0.70	*U* = 3672	0.19	X^2=0.81	0.37
Traumatic events prior to COVID-19 (yes), n (%)	748 (53%)	*U* = 6908	0.22	*U* = 7269.5	0.59	*U* = 7247.5	0.53	*U* = 7006.5	0.29	*U* = 7521	0.93	*U* = 6804.5	0.17	X^2=0.18	0.67
Frontline HCW(yes), n (%)	580 (40.5%)	*U* = 7346	0.48	*U* = 6516.5	**0.03***	*U* = 6775	0.06	*U* = 6419.5	**0.02***	*U* = 7437.5	0.54	*U* = 6886.5	0.14	X^2=5.86	**0.02***
Relative or friends got COVID-19 (yes), n (%)	564 (39.7%)	*U* = 6793	0.28	*U* = 7174.5	0.72	*U* = 6592	0.12	*U* = 7071	0.57	*U* = 6904.5	0.32	*U* = 6783.5	0.29	X^2=0.51	0.82
Hours of TV viewing, (more than 3 h), n (%)	264 (18.4%)	*r* = 0.01	0.89	*r* = 0.05	0.41	*r* = 0.04	0.52	*r* = 0	0.89	*r*=−0.03	0.62	*r* = 0.02	0.7	*U* = 5144.5	0.48
Hours of TV viewing, (more than 3 h), n (%) (follow-up period)	27 (10.8%)	*r* = 0.23	**<0.01****	*r* = 0.22	**0.01***	*r* = 0.25	**<0.01****	*r* = 0.18	**<0.01****	*r* = 0.21	**0.01***	*r* = 0.25	**<0.01****	*U* = 3679	**<0.01****
Alcohol use (last month), mean±SD	1.61±0.75	*r*=−0.03	0.56	*r*=−0.02	0.66	*r* = 0	0.98	*r*=−0.01	0.82	*r*=−0.02	0.66	*r*=−0.02	0.70	*U* = 5022.5	0.31
Alcohol use (last month), mean±SD (follow-up period)	1.81±0.87	*r*=−0.07	0.23	*r*=−0.09	0.11	*r*=−0.03	0.63	*r*=−0.03	0.63	*r*=−0.05	0.37	*r*=−0.06	0.29	*U* = 4615	0.06
Tobacco use (last month), n (%)	259 (18.1%)	*U* = 3867	0.37	*U* = 4070	0.71	*U* = 3851.5	0.32	*U* = 4117.5	0.79	*U* = 3810	0.24	*U* = 4137	0.84	X^2=1.62	0.20
Tobacco use (last month), n (%) (follow-up period)	44 (17.5%)	*U* = 4145.5	0.32	*U* = 4059.5	0.24	*U* = 4096	0.24	*U* = 4241.5	0.79	*U* = 4462	0.13	*U* = 3905	0.44	X^2=0.01	0.94
Cannabis use (last month), n (%)	19 (1.3%)	*U* = 275.5	0.41	*U* = 240	0.28	*U* = 204.5	0.13	*U* = 263	0.35	*U* = 272.5	0.33	*U* = 273.5	0.42	X^2=3.45	0.06
Cannabis use (last month), n (%) (follow-up period)	9 (3.5%)	*U* = 941.5	0.87	*U* = 894	0.69	*U* = 848	0.49	*U* = 920	0.78	*U* = 905.5	0.69	*U* = 952.5	0.92	X^2=0.03	0.85
Other drugs use (last month), n (%)	8 (0.6%)	*U* = 132.5	0.23	*U* = 175	0.46	*U* = 86	0.07	*U* = 174	0.43	*U* = 108	0.09	*U* = 130	0.24	X^2=0.89	0.35
Other drugs use (last month), n (%) (follow-up period)	25 (10%)	*U* = 2035	0.21	*U* = 1947	0.13	*U* = 1914	0.07	*U* = 1855.5	0.06	*U* = 2266	0.57	*U* = 1947	0.13	X^2=1.61	0.21
Habits and lifestyle changes during COVID-19 lockdown, mean±SD	2.03±0.64	*r* = 0.04	0.52	*r* = 0.02	0.66	*r* = 0.1	0.11	*r* = 0.01	0.86	*r* = 0.03	0.61	*r* = 0.04	0.44	*U* = 5190.5	0.52
Habits and lifestyle changes during COVID-19 lockdown, mean±SD (follow-up period)	1.94±0.63	*r* = 0.01	0.86	*r* = 0.02	0.65	*r* = 0.03	0.55	*r* = 0.02	0.74	*r* = 0.02	0.70	*r* = 0.02	0.68	*U* = 4615	0.06
Communication with family members (last month) mean±SD	3.65±0.58	*r*=−0.01	0.86	*r*=−0.02	0.72	*r*=−0.06	0.30	*r* = 0.01	0.78	*r*=−0.04	0.44	*r*=−0.02	0.70	*U* = 5254	0.59
Colleagues in leisure time (yes), mean±SD	3.11±1.03	*r*=−0.05	0.37	*r*=−0.01	0.76	*r*=−0.11	0.07	*r*=−0.07	0.26	*r*=−0.09	0.13	*r*=−0.07	0.25	*U* = 4968.5	0.27
Perceived risk level, (yes), n (%)	858 (59.9%)	*U* = 7126	0.25	*U* = 7703	0.94	*U* = 7638.5	0.84	*U* = 7404.5	0.53	*U* = 7591.5	0.75	*U* = 7539	0.72	X^2=1.03	0.31
Perceived risk level, (yes), n (%) (follow-up period)	136 (54.2%)	*U* = 5508	**<0.01****	*U* = 5126.5	**<0.01****	*U* = 5210.5	**<0.01****	*U* = 5412	**<0.01****	*U* = 6208.5	**<0.01****	*U* = 4966	**<0.01****	X^2=12.58	**<0.01****
Extra stress at work, (yes), n (%)	685 (47.8%)	*U* = 7203	0.22	*U* = 7306	0.31	*U* = 7116	0.14	*U* = 6732.5	**0.03***	*U* = 7647	0.64	*U* = 6982.5	0.12	X^2=0.71	0.40

(*continued on next page*)

Table 1 (*continued*)

	Descriptive analyses	Bivariate analyses **Dissociation (follow-up)**		**Hyperarousal (follow-up)**		***Re*-experiencing the traumatic event (follow-up)**		**Avoiding (follow-up)**		**Social functioning (follow-up)**		**Total score (follow-up)**		**ASD (follow-up)**	
		Statistics	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**
Extra stress at work, (yes), n (%) (follow-up period)	140 (55.8%)	$U = 3562$	**<0.01****	$U =$ 2448.5	**<0.01****	$U =$ 3895.5	**<0.01****	$U = 4261$	**<0.01****	$U = 4632$	**<0.01****	$U =$ 2474.5	**<0.01****	X^2=32.81	**<0.01****
I was afraid of falling ill with COVID-19, (yes), n (%)	746 (52.1%)	$U =$ 7384.5	0.43	$U =$ 7261.5	0.33	$U = 7245$	0.27	$U =$ 7556.5	0.63	$U = 7620$	0.69	$U = 7317$	0.38	X^2=1.93	0.16
I was afraid of falling ill with COVID-19, (yes), n (%) (follow-up period)	128 (51%)	$U =$ 5792.5	**<0.01****	$U =$ 5085.5	**<0.01****	$U = 5452$	**<0.01****	$U =$ 5565.5	**<0.01****	$U =$ 6177.5	**<0.01****	$U = 4969$	**<0.01****	X^2=14.24	**<0.01****
Little control over whether I would get infected, (yes), n (%)	782 (54.6%)	$U =$ 7340.5	0.36	$U = 7311$	0.34	$U = 7350$	0.34	$U = 7175$	0.21	$U = 7526$	0.51	$U =$ 7105.5	0.19	X^2=0.41	0.52
Little control over whether I would get infected, (yes), n (%) (follow-up period)	105 (41.8%)	$U = 5180$	**<0.01****	$U =$ 5020.5	**<0.01****	$U = 5563$	**<0.01****	$U = 5974$	**<0.01****	$U =$ 6123.5	**<0.01****	$U = 4908$	**<0.01****	X^2=6.94	**<0.01****
I would be unlikely to survive if I were to get COVID-19 (yes), n (%)	160 (11.2%)	$U = 1894$	0.28	$U = 1607$	**0.04***	$U =$ 2011.5	0.47	$U = 1757$	0.11	$U = 2017$	0.45	$U =$ 1673.5	0.07	X^2=0.50	0.48
I would be unlikely to survive if I were to get COVID-19 (yes), n (%)(follow-up period)	20 (8%)	$U =$ 1667.5	**0.03***	$U = 1712$	**0.05***	$U = 1832$	0.08	$U = 1860$	0.12	$U = 1854$	0.07	$U = 1625$	**0.02***	X^2=0.74	0.39
Resigning because of COVID-19, (yes), n (%)	114 (8%)	$U =$ 1884.5	0.70	$U =$ 1828.5	0.57	$U =$ 1726.5	0.30	$U =$ 1814.5	0.51	$U =$ 1939.5	0.83	$U = 1806$	0.52	X^2=0.16	0.90
Resigning because of COVID-19, (yes), n (%) (follow-up period)	29 (11.6%)	$U = 1712$	**<0.01****	$U = 1582$	**<0.01****	$U = 1618$	**<0.01****	$U = 0.01$	**<0.01****	$U =$ 1962.5	**<0.01****	$U =$ 1453.5	**<0.01****	X^2=12.75	**<0.01****
Fear of spreading COVID-19, (yes), n (%)	1182 (82.5%)	$U =$ 4653.5	0.61	$U =$ 4411.5	0.29	$U = 4500$	0.35	$U = 4475$	0.34	$U = 4755$	0.75	$U = 4504$	0.41	X^2=2.05	0.15
Fear of spreading COVID-19, (yes), n (%) (follow-up period)	203 (80.9%)	$U =$ 3349.5	**<0.01****	$U =$ 2850.5	**<0.01****	$U =$ 3382.5	**<0.01****	$U =$ 3470.5	**0.01***	$U =$ 3929.5	**0.01***	$U =$ 2813.5	**0.01***	X^2=4.84	**0.03***
Fear of relatives got COVID-19 (yes), n (%)	672 (46.9%)	$U = 7528$	0.89	$U = 7465$	0.80	$U = 7362$	0.63	$U =$ 7061.5	0.31	$U =$ 7265.5	0.47	$U = 7372$	0.68	X^2=1.01	0.32
Fear of relatives got COVID-19 (yes), n (%) (follow-up period)	87 (34.7%)	$U =$ 4480.5	**<0.01****	$U = 4786$	**<0.01****	$U = 5275$	**<0.01****	$U =$ 5598.5	**<0.01****	$U = 5111$	**<0.01****	$U =$ 4476.5	**<0.01****	X^2=7.49	**<0.01****
People avoid my family because of my work, (yes), n (%)	259 (18.1%)	$U =$ 4020.5	0.94	$U =$ 3730.5	0.43	$U = 3687$	0.32	$U =$ 4020.5	0.94	$U = 3868$	0.60	$U =$ 3977.5	0.86	X^2=0.41	0.52
People avoid my family because of my work, (yes), n (%) (follow-up period)	29 (11.6%)	$U =$ 1845.5	**<0.01****	$U =$ 1707.5	**<0.01****	$U = 1747$	**<0.01****	$U = 2005$	**<0.01****	$U = 2228$	**<0.01****	$U =$ 1647.5	**<0.01****	X^2=6.88	**<0.01****
Access to PPE, (yes), mean±SD	2.77±0.96	r=−0.11	0.09	r=−0.06	0.32	$r = 0.01$	0.79	r=−0.04	0.46	r=−0.06	0.34	r=−0.06	0.33	$U =$ 3882.5	0.23
Access to PPE, (yes), mean±SD (follow-up period)	3.16±0.89	r=−0.05	0.38	r=−0.02	0.68	r=−0.03	0.59	r=−0.06	0.32	r=−0.08	0.15	r=−0.05	0.40	$U =$ 4848.5	0.17
Pressed not to wear protective material, (yes), mean±SD	1.74±0.82	$r = 0.03$	0.56	$r = 0.04$	0.53	$r = 0.01$	0.83	$r = 0$	0.99	$r = 0.02$	0.73	$r = 0.02$	0.68	$U =$ 4688.5	0.35
Pressed not to wear protective material, (yes), mean±SD (follow-up period)	1.41±0.59	$r = 0.12$	**0.05***	$r = 0.15$	**0.01***	$r = 0.14$	**0.02***	$r = 0.12$	**0.04***	$r = 0.08$	0.16	$r = 0.14$	**0.02***	$U = 4678$	**<0.05***
Pressed to reuse protective material, (yes), mean±SD	2.57±1.05	r=−0.03	0.62	r=−0.06	0.29	r=−0.04	0.44	r=−0.05	0.37	r=−0.02	0.65	r=−0.05	0.41	$U = 5096$	0.90
Pressed to reuse protective material, (yes), mean±SD (follow-up period)	2.1 ± 0.96	$r = 0.12$	**0.04***	$r = 0.14$	**0.01***	$r = 0.1$	0.09	$r = 0.03$	0.57	$r = 0.11$	0.06	$r = 0.12$	**0.05***	$U =$ 5057.5	0.38
	2.67±1.16	r=−0.08	0.24	r=−0.07	0.33	r=−0.05	0.45	r=−0.09	0.18	r=−0.06	0.35	r=−0.08	0.25		0.46

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Table 1 (*continued*)

	Descriptive analyses	Bivariate analyses Dissociation (follow-up)		Hyperarousal (follow-up)		*Re*-experiencing the traumatic event (follow-up)		Avoiding (follow-up)		Social functioning (follow-up)		Total score (follow-up)		ASD (follow-up)	
		Statistics	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**
Access to a screening test, (yes), mean±SD														U = 2736.5	
Access to a screening test, (yes), mean±SD (follow-up period)	3.24±0.99	r=−0.06	0.34	r=−0.03	0.62	r=−0.03	0.62	r=−0.08	0.17	r=−0.11	0.06	r=−0.06	0.32	U = 4512.5	**0.03***
Receive information about precautions, (yes), mean±SD	3.03±0.96	r = 0.01	0.78	r = 0.02	0.72	r = 0.01	0.86	r=−0.01	0.82	r = 0.07	0.24	r = 0.01	0.79	U = 5263	0.71
Receive information about precautions, (yes), mean±SD (follow-up period)	3.25±0.82	r=−0.13	**0.03***	r=−0.12	0.04	r=−0.16	**<0.01****	r=−0.17	**<0.01****	r=−0.21	**0.01***	r=−0.17	**<0.01****	U = 4462.5	**0.03***
Prepared to treat patient, (yes), mean±SD	2.43±1.1	r = 0.01	0.97	r=−0.03	0.62	r = 0.01	0.83	r=−0.02	0.75	r = 0.02	0.68	r = 0.01	0.92	U = 4131	0.91
Prepared to treat patient, (yes), mean±SD (follow-up period)	2.42±1.12	r=−0.12	**0.05***	r=−0.12	0.04	r=−0.09	0.14	r=−0.13	**0.03***	r=−0.15	**0.01***	r=−0.13	**0.03***	U = 4539	**0.05***
Well-defined action protocol (yes), mean±SD	2.33±0.89	r=−0.05	0.39	r=−0.01	0.84	r=−0.04	0.46	r=−0.03	0.57	r=−0.02	0.65	r=−0.04	0.51	U = 4557	0.24
Well-defined action protocol (yes), mean±SD (follow-up period)	2.45±0.89	r=−0.11	0.07	r=−0.15	**0.01***	r=−0.15	**<0.01****	r=−0.09	0.12	r=−0.15	**0.01***	r=−0.14	**0.02***	U = 4785	0.14
Receive conflicting information, (yes), mean±SD	2.77±0.90	r=−0.04	0.46	r=−0.03	0.58	r=−0.04	0.49	r=−0.08	0.20	r=−0.04	0.47	r=−0.05	0.38	U = 5351.5	0.91
Receive conflicting information, (yes), mean±SD (follow-up period)	2.59±0.83	r = 0.16	**<0.01****	r = 0.21	**<0.01****	r = 0.22	**<0.01****	r = 0.1	0.10	r = 0.14	**0.02***	r = 0.19	**<0.01****	U = 4637	0.07
Resource pressures: decision making, (yes), n (%)	239 (16.7%)	U = 4221.5	0.24	U = 3882.5	**0.05***	U = 4016.5	0.07	U = 3784	**0.02***	U = 4512.5	0.58	U = 3905	0.06	X^2=1.15	0.28
Resource pressures: decision making, (yes), n (%) (follow-up period)	43 (17.1%)	U = 3943.5	0.20	U = 4271	0.63	U = 3828	0.09	U = 4049.5	0.29	U = 4033	0.22	U = 3963	0.23	X^2=0.94	0.33
Deceased patient assigned to your care, (yes), n (%)	420 (29.3%)	U = 6276.5	0.65	U = 5736	0.13	U = 6147	0.45	U = 5509	**0.04***	U = 6241	0.55	U = 5894	0.24	X^2=2.48	0.12
Deceased patient assigned to your care, (yes), n (%) (follow-up period)	93 (37.1%)	U = 4999	**<0.01****	U = 4888	**<0.01****	U = 5451	**<0.01****	U = 6002	**0.01***	U = 5809.5	**<0.01****	U = 4895	**<0.01****	X^2=10.36	**<0.01****
Flexibilization at work, (yes), n (%)	2.19±1.23	r = 0.1	0.27	r = 0.11	0.21	r = 0.05	0.56	r = 0.03	0.72	r = 0.11	0.21	r = 0.09	0.33	U = 1061	0.75
Flexibilization at work, (yes), n (%) (follow-up period)	2.07±1.09	r=−0.12	0.23	r=−0.12	0.24	r=−0.11	0.26	r=−0.17	0.09	r=−0.1	0.32	r=−0.14	0.17	U = 765	0.33
Healthy living facilities in the work shift, (yes), mean±SD	2.28±1.14	r=−0.07	0.27	r=−0.07	0.28	r=−0.04	0.49	r=−0.03	0.58	r = 0.01	0.87	r=−0.06	0.38	U = 3378	0.79
Healthy living facilities in the work shift, (yes), mean±SD (follow-up period)	534 (37.3%)	r=−0.20	**<0.01****	r=−0.21	**<0.01****	r=−0.22	**<0.01****	r=−0.16	**<0.01****	r=−0.23	**0.01***	r=−0.22	**<0.01****	U = 4281.5	**<0.01****
Working more hours (yes), n (%)	534 (37.3%)	U = 6737.5	0.54	U = 6222.5	0.11	U = 6891.5	0.73	U = 6256.5	0.11	U = 7002.5	0.90	U = 6205.5	0.11	X^2=0.01	0.99
Working more hours (yes), n (%) (follow-up period)	134 (53.4%)	U = 4725.5	**<0.01****	U = 4516	**<0.01****	U = 5485.5	**<0.01****	U = 5992	**<0.01****	U = 5655	**<0.01****	U = 4515.5	**<0.01****	X^2=11.39	**<0.01****
Redeployed, (yes), n (%)	365 (25.5%)	U = 6089	0.61	U = 5891	0.38	U = 5957	0.41	U = 6109	0.64	U = 6296.5	0.92	U = 6201.5	0.79	X^2=0.65	0.42
Redeployed, (yes), n (%) (follow-up period)	67 (26.7%)	U = 4615	**<0.01****	U = 5074.5	**0.02***	U = 4762.5	**<0.01****	U = 4965.5	**0.01***	U = 5393.5	0.06	U = 4770	**<0.01****	X^2=5.84	**0.02***
	78 (5.4%)	U = 1192	0.14	U = 1157	0.11	U = 1101	**<0.05***		0.23		**0.05***		0.18	X^2=7.87	**0.01***

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Table 1 (*continued*)

	Descriptive analyses	Bivariate analyses **Dissociation (follow-up)**		**Hyperarousal (follow-up)**		***Re*-experiencing the traumatic event (follow-up)**		**Avoiding (follow-up)**		**Social functioning (follow-up)**		**Total score (follow-up)**		**ASD (follow-up)**	
		Statistics	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**
Leaving home for fear of spreading it to my family, (yes), n (%)								U = 1262.5		U = 1136.5		U = 1214.5			
Leaving home for fear of spreading it to my family, (yes), n (%) (follow-up period)	14 (5.6%)	U = 1127	**0.03***	U = 979	**<0.01****	U = 1076	**0.01***	U = 1295	0.14	U = 1261	0.06	U = 1029	**0.01***	X^2=3.61	0.06
Emotional impact of COVID-19 on colleagues, (yes), n (%)	1009 (70.5%)	U = 6158.5	0.80	U = 6220	0.90	U = 5821.5	0.31	U = 6254	0.95	U = 6170	0.79	U = 6194	0.86	X^2=0.42	0.84
Emotional impact of COVID-19 on colleagues, (yes), n (%) (follow-up period)	196 (78.1%)	U = 4635.5	0.09	U = 4318	**0.02***	U = 4492	**0.03***	U = 5353	0.93	U = 4800	0.13	U = 4607.5	0.09	X^2=0.69	0.41
Colleagues support, (yes), mean±SD	3.24±0.80	r=−0.02	0.67	r=−0.09	0.12	r=−0.06	0.32	r = 0	0.89	r=−0.03	0.61	r=−0.05	0.42	U = 5457	0.99
Colleagues support, (yes), mean±SD (follow-up period)	3.24±0.76	r=−0.22	**<0.01****	r=−0.19	**<0.01****	r=−0.18	**<0.01****	r=−0.24	**<0.01****	r=−0.26	**0.01***	r=−0.24	**<0.01****	U = 3851	**<0.01****
Senior support, (yes), mean±SD	2.6 ± 1.01	r = 0.01	0.91	r=−0.04	0.51	r=−0.03	0.61	r = 0.02	0.73	r = 0.04	0.48	r = 0.01	0.91	U = 5104	0.86
Senior support, (yes), mean±SD (follow-up period)	2.51±1.01	r=−0.27	**<0.01****	r=−0.22	**<0.01****	r=−0.22	**<0.01****	r=−0.26	**<0.01****	r=−0.31	**0.01***	r=−0.27	**<0.01****	U = 3818.5	**<0.01****
Disappointment with the institution, (yes), mean±SD	2.49±0.97	r = 0.03	0.55	r = 0.02	0.65	r = 0.03	0.57	r = 0	0.90	r=−0.03	0.61	r = 0.02	0.71	U = 5457.5	0.99
Disappointment with the institution, (yes), mean±SD (follow-up period)	2.59±0.95	r = 0.33	**<0.01****	r = 0.38	**<0.01****	r = 0.31	**<0.01****	r = 0.26	**<0.01****	r = 0.3	**0.01***	r = 0.35	**<0.01****	U = 3591.5	**<0.01****
Overwhelmed by work, (yes), mean±SD	2.13±0.85	r=−0.03	0.61	r=−0.03	0.54	r = 0	0.90	r=−0.02	0.72	r=−0.06	0.34	r=−0.03	0.62	U = 5063.5	0.37
Overwhelmed by work, (yes), mean±SD (follow-up period)	2.28±0.84	r = 0.42	**<0.01****	r = 0.47	**<0.01****	r = 0.4	**<0.01****	r = 0.36	**<0.01****	r = 0.43	**0.01***	r = 0.46	**<0.01****	U = 2870	**<0.01****
Feeling of doing something good for others, (yes), mean±SD	3.33±0.78	r = 0.04	0.44	r = 0.01	0.91	r = 0.01	0.84	r = 0.06	0.29	r = 0.06	0.29	r = 0.04	0.52	U = 5090	0.41
Feeling of doing something good for others, (yes), mean±SD (follow-up period)	3.22±0.73	r=−0.21	**<0.01****	r=−0.21	**<0.01****	r=−0.16	**<0.01****	r=−0.16	**<0.01****	r=−0.27	**0.01***	r=−0.22	**<0.01****	U = 4389.5	**0.02***
Need emotional support, (yes), n (%)	209 (14.6%)	U = 7201.5	0.22	U = 7243.5	0.27	U = 7221.5	0.21	U = 7030	0.12	U = 7668	0.67	U = 7055	0.15	X^2=0.83	0.36
Psychological support over the follow-up period, n (%)	16 (6.4%)	U = 1268	**0.02***	U = 1105	**<0.01****	U = 1135	**<0.01****	U = 1097.5	**<0.01****	U = 1175	**<0.01****	U = 1061.5	**<0.01****	X^2=11.36	**<0.01****
SASRQ															
Dissociation, mean±SD	2.53±2.88	r = 0.12	**0.05***	r = 0.15	**0.01**	r = 0.17	**<0.01****	r = 0.07	0.25	r = 0.04	0.43	r = 0.13	**0.02***	U = 4864.5	0.20
Dissociation, mean±SD (follow-up period)	2.11±2.73	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Hyperarousal, mean±SD	2.59±1.94	r = 0.11	0.06	r = 0.09	0.12	r = 0.12	**0.05***	r = 0.07	0.26	r = 0.04	0.44	r = 0.1	0.08	U = 5063.5	0.40
Hyperarousal, mean±SD (follow-up period)	2.27±2.06	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Reexperiencing the traumatic event, mean±SD	1.45±1.95	r = 0.11	0.06	r = 0.11	0.07	r = 0.13	**0.03***	r = 0.09	0.15	r = 0.01	0.98	r = 0.11	0.06	U = 4912	0.22
Reexperiencing the traumatic event, mean±SD (follow-up period)	1.28±1.93	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
	1.69±1.95	r = 0.08	0.16	r = 0.11	0.06	r = 0.12	**0.04***	r = 0.06	0.30	r=−0.02	0.67	r = 0.09	0.12	U = 5176	0.54

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Table 1 (*continued*)

	Descriptive analyses	Bivariate analyses Dissociation (follow-up)		Hyperarousal (follow-up)		*Re*-experiencing the traumatic event (follow-up)		Avoiding (follow-up)		Social functioning (follow-up)		Total score (follow-up)		ASD (follow-up)	
		Statistics	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**	**Statistics**	**p-value**
Avoidance of remiders of the traumatic event, mean±SD															
Avoidance of remiders of the traumatic event, mean±SD (follow-up period)	1.4 ± 1.86	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Impact on social functioning, mean±SD	0.49±0.7	$r = 0.15$	**<0.01****	$r = 0.15$	**0.01**	$r = 0.19$	**<0.01****	$r = 0.06$	0.31	$r = 0.08$	0.19	$r = 0.15$	**<0.01****	$U = 5071$	0.35
Impact on social functioning, mean±SD (follow-up period)	0.44±0.68	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Total score, mean±SD	8.75±8.52	$r = 0.12$	**0.04***	$r = 0.14$	**0.02**	$r = 0.16$	**<0.01****	$r = 0.08$	0.19	$r = 0.02$	0.65	$r = 0.13$	**0.03***	$U = 4964$	0.30
Total score, mean±SD (follow-up period)	7.5 ± 8.39	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
Diagnosis of Acute Stress Disorder (yes), n (%)	349 (24.4%)	$U =$ 4345.5	**0.02***	$U =$ 4439.5	**0.04***	$U = 4135$	**<0.01****	$U =$ 4812.5	0.19	$U =$ 5295.5	0.81	$U =$ 4350.5	**0.02***	X^2=0.40	0.53
Diagnosis of Acute Stress Disorder (yes), n (%) (follow-up period)	56 (23.3%)	(-)	(-)			(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)	(-)
GHQ-28															
Somatic	8.18±4.99	$r = 0.03$	0.59	$r = 0.01$	0.88	$r = 0.06$	0.33	$r = 0.01$	0.76	$r = 0.02$	0.75	$r = 0.03$	0.60	$U =$ 5382.5	0.87
Somatic (follow-up period)	8.74±5.19	$r = 0.59$	**<0.01****	$r = 0.65$	**<0.01****	$r = 0.53$	**<0.01****	$r = 0.55$	**<0.01****	$r = 0.47$	**0.01***	$r = 0.63$	**<0.01****	$U =$ 1835.5	**<0.01****
Anxiety	8.53±5.61	$r = 0.05$	0.36	$r = 0,04$	0.51	$r = 0.09$	0.12	$r = 0.02$	0.65	$r = 0.01$	0.93	$r = 0.05$	0.36	$U =$ 5405.5	0.91
Anxiety (follow-up period)	7.92±5.79	$r = 0.66$	**<0.01****	$r = 0,77$	**<0.01****	$r = 0.62$	**<0.01****	$r = 0.55$	**<0.01****	$r = 0.56$	**0.01***	$r = 0.72$	**<0.01****	$U =$ 1487.5	**<0.01****
Social	8.94±3.26	r=−0.04	0.45	r=−0,05	0.36	$r = 0.03$	0.63	r=−0.05	0.39	r=−0.08	0.20	r=−0.04	0.51	$U =$ 5055.5	0.39
Social (follow-up period)	9.51±3.01	$r = 0.51$	**<0.01****	$r = 0,51$	**<0.01****	$r = 0.4$	**<0.01****	$r = 0.35$	**<0.01****	$r = 0.48$	**0.01***	$r = 0.5$	**<0.01****	$U = 2317$	**<0.01****
Depression	1.76±3.05	$r = 0.2$	**<0.01****	$r = 0,19$	**<0.01****	$r = 0.25$	**<0.01****	$r = 0.12$	**0.05***	$r = 0.07$	0.23	$r = 0.2$	**<0.01****	$U =$ 4694.5	0.08
Depression (follow-up period)	1.99±3.66	$r = 0.51$	**<0.01****	$r = 0,41$	**<0.01****	$r = 0.37$	**<0.01****	$r = 0.39$	**<0.01****	$r = 0.44$	**0.01***	$r = 0.47$	**<0.01****	$U =$ 2113,5	**<0.01****
Total score, mean±SD	27.41±13.27	$r = 0.07$	0.24	$r = 0,05$	0.39	$r = 0.13$	**0.03***	$r = 0.03$	0.57	$r = 0.01$	0.9	$r = 0.07$	0.23	$U =$ 5408.5	0.91
Total score, mean±SD (follow-up period)	28.16±14.09	$r = 0.73$	**<0.01****	$r = 0,77$	**<0.01****	$r = 0.64$	**<0.01****	$r = 0.6$	**<0.01****	$r = 0.62$	**0.01***	$r = 0.76$	**<0.01****	$U =$ 1086.5	**<0.01****
Nurses, n (%)	372 (26%)	$U =$ 5569.5	0.54	$U = 5638$	0.65	$U = 5813$	0.91	$U =$ 5346.5	0.27	$U = 5829$	0.94	$U =$ 5733.5	0.79	X^2=0.17	0.68
Sleep disturbances (yes), n (%)	807 (56.4%)	$U =$ 7405.5	0.42	$U =$ 7498.5	0.54	$U =$ 7728.5	0.83	$U = 7733$	0.84	$U =$ 7633.5	0.66	$U =$ 7641.5	0.72	X^2=0.11	0.74
Sleep disturbances (yes), n (%) (follow-up period)	112 (44.6%)	$U =$ 3524,5	**<0.01****	$U =$ 2633,5	**<0.01****	$U = 4159$	**<0.01****	$U =$ 4542,5	**<0.01****	$U = 5247$	**<0.01****	$U =$ 2872,5	**<0.01****	X^2=0.27	**<0.01****
Sick leave COVID-19, n (%)	18 (7.2%)	$U =$ 1886.5	0.45	$U = 1825$	0.35	$U =$ 2084.5	0.96	$U =$ 1970.5	0.64	$U =$ 1839.5	0.29	$U =$ 1921.5	0.55	X^2=1.40	0.24
Sick leave mental health, n (%)	29 (11.6%)	$U =$ 2672.5	0.11	$U = 2693$	0.14	$U =$ 3052.5	0.61	$U =$ 2603.5	0.07	$U =$ 2912.5	0.31	$U = 2680$	0.14	X^2=0.07	0.80

SD: Standard Deviation; COVID-19: Coronavirus Disease 2019; HCW: Health Care Workers; PCR: Polymerase Chain Reaction; PPE: Personal Protective Equipment; SASRQ: Stanford acute Stress Reaction Questionnaire; GHQ-28: General Health Questionnaire.

Development of stress reaction and rate of ASD over the follow-up period

We observed that HCW improved significantly in hyperarousal dimension (*Wilcoxon Signed-Rank Test:* $Z=-2.53$; $p = 0.01$; 2.71±2 vs. 2.27±2.06) as well as in total score of the SASR-Q (*Wilcoxon Signed-Rank Test:* $Z=-2.53$; $p = 0.01$; 8.62±8.30 vs. 7.50±8.39). On the other hand, we did not find significant differences in the rate of ASD diagnoses (*McNemar test:* $p = 0.99$).

Predictors of stress reaction and ASD diagnosis

Bivariate analyses results are summarized in Table 2. Multivariate analyses showed that dissociation dimension measured by SASR-Q was significantly related to hours of TV viewing at follow-up period, fear of relatives got COVID-19 at follow-up period, healthy living facilities in the work shift at follow-up period, redeployed at follow-up period, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up, GHQ social at

Table 2
Multivariate analysis for each SASRQ subscale and ASD diagnosis as dependent variables.

	β	*t*	*p*	95% CI		
Dissociation						
Hours consuming TV at the second follow-up period at the follow-up period	0.46	2.64	$p<0.01$	0.12–0.81		
Fear to the loved ones are infected (follow-up period)	0.51	2.01	$p<0.05$	0.01–1.01		
Redeployed at the follow-up period	0.58	2.25	$p = 0.03$	0.07–1.10		
Healthy living facilities in the work shift at follow-up period	−0.23	−2.27	$p = 0.02$	−0.42-(−0.03)		
GHQ-Somatic at follow-up period	0.14	4.23	$p<0.01$	0.07–0.20		
GHQ-Anxiety symptoms at the follow-up period	0.12	3.64	$p<0.01$	0.05–0.18		
GHQ-Social at the follow-up period	0.16	3.67	$p<0.01$	0.08–0.25		
GHQ-Depression at the follow-up period	0.14	3.81	$p<0.01$	0.07–0.22		
F(26)=38.40, $p<0.01$; $r^2=0.57$, $n = 250$						
Hyperarousal						
HCW frontile workers	0.37	2.44	$p = 0.02$	0.07–0.67		
Hours consuming news on TV about COVID-19 at the second follow-up period	0.25	2.21	$p = 0.03$	0.03–0.47		
Working more hours at the follow-up period	0.37	2.27	$p = 0.02$	0.05–0.70		
GHQ-Somatic follow-up period	0.07	3.37	$p<0.01$	0.03–0.11		
GHQ-Anxiety symptoms at follow-up period	0.11	4.87	$p<0.01$	0.07–0.16		
GHQ-Social at the follow-up period	0.07	2.05	$p = 0.04$	0.01–0.13		
F(30)=66.37, $p<0.01$; $r^2=0.68$, $n = 250$						
***Re*-experiencing the traumatic event**						
Hours consuming information related to COVID-19 on TV at the follow-up period	0.40	3.03	$p<0.01$	0.12–0.66		
Perceived risk of contagion at work at the follow-up period	0.38	2.06	$p = 0.04$	0.02–0.74		
Lack of preventive information to avoid COVID-19 contagion at the follow-up period	−0.22	−1.99	$p<0.05$	−0.44-(−0.01)		
Redeployed at the follow-up period	0.42	2.12	$p = 0.04$	0.03–0.81		
Leaving home for fear of spreading it to my family at baseline	1.10	2.77	$p<0.01$	0.32–1.89		
GHQ-Somatic at the follow-up period	0.06	2.61	$p = 0.01$	0.02–0.11		
GHQ-Anxiety symptoms at the follow-up period	0.12	5.51	$p<0.01$	0.08–0.17		
GHQ-Social at the follow-up period	0.07	2.05	$p = 0.04$	0.01–0.13		
GHQ-Total score at baseline	0.02	2.05	$p = 0.04$	0.01–0.03		
F(29)=24.32, $p<0.01$; $r^2=0.51$, $n = 250$						
Avoiding						
Frontline HCW workers	0.52	2.86	$p<0.01$	0.16–0.88		
Perceived risk of contagion at work at the follow-up period	0.49	2.57	$p = 0.01$	0.12–0.87		
Lack of preventive information to avoid COVID-19 infection at the follow-up period	−0.29	−2.67	$p<0.01$	−0.51-(−0.08)		
GHQ-Somatic follow-up period	0.12	4.81	$p<0.01$	0.07–0.17		
GHQ-Anxiety symptoms at the follow-up period	0.05	2.12	$p = 0.04$	0.01–0.10		
GHQ-Depression at the follow-up period	0.07	2.42	$p = 0.02$	0.01–0.13		
F (25)=26.41, $p<0.01$; $r^2=0.42$, $n = 250$						
Social functioning						
Lack of preventive information to avoid COVID-19 infection at the follow-up period	−0.13	−3.25	$p<0.01$	−0.20-(−0.05)		
Leaving home for fear of spreading it to my family at baseline	0.43	2.90	$p<0.01$	0.14–0.72		
Feeling overwhelmed at work at the follow-up period	0.10	2.27	$p = 0.02$	0.01–0.19		
GHQ-Anxiety symptoms at the follow-up period	0.03	3.97	$p<0.01$	0.02–0.05		
GHQ-Social at the follow-up period	0.05	4.05	$p<0.01$	0.03–0.07		
GHQ-Depression at the follow-up period	0.03	2.88	$p<0.01$	0.01–0.05		
F(21)=27.49, $p<0.01$; $r^2=0.50$, $n = 250$						
Total score						
Hours consuming news related to pandemic on TV at the second follow-up period	1.55	3.13	$p<0.01$	0.57–2.52		
Healthy living facilities in the work shift at follow-up period	−0.60	−1.98	$p<0.05$	−1.20-(−0.01)		
GHQ-Total score at baseline	0.15	2.12	$p = 0.04$	0.01–0.28		
GHQ-Somatic follow-up period	0.38	4.01	$p<0.01$	0.19–0.56		
GHQ-Anxiety symptoms at the follow-up period	0.45	4.73	$p<0.01$	0.26–0.64		
GHQ-Social at the follow-up period	0.38	2.97	$p<0.01$	0.13–0.64		
GHQ-Depression at the follow-up period	0.28	2.58	$p = 0.01$	0.07–0.49		
F(25)=35.83, $p<0.01$; $r^2=0.63$, $n = 250$						
	B	***SE***	***Wald***	***p***	***OR***	***95%CI***
ASD						
Hours consuming information related to pandemic on TV at the second follow-up period	0.91	0.31	8.37	$p<0.01$	2.48	1.34–4.58
Access to PPE at the follow-up period	−0.55	0.24	5.19	$p = 0.02$	0.58	0.36–0.93
Leaving home for fear of spreading it to my family	2.90	1.07	7.30	$p<0.01$	18.09	2.21–147.80
GHQ-Somatic symptoms at the follow-up period	0.16	0.06	7.27	$p<0.01$	1.17	1.04–1.31
GHQ-Anxiety at the follow-up period	0.21	0.06	13.40	$p<0.01$	1.24	1.10–1.38
GHQ-Social at the follow-up period	0.21	0.08	7.52	$p<0.01$	1.23	1.06–1.42
$X^2(25)= 121.33$, $p<0.01$, R^2 Cox and Snell= 0.40, R^2 Nagelkerke= 0.60, $n = 250$						

COVID-19: Coronavirus Disease 2019; GHQ-28: General Health Questionnaire; HCW: Health Care Workers;.

follow-up and GHQ depression at follow-up.

Hyperarousal dimension was predicted by: frontline HCW, hours of TV viewing at follow-up period, working more hours at follow-up period, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up and GHQ social at follow-up.

Reexperiencing the traumatic event was significantly associated in the multivariate model with: hours of TV viewing at follow-up period, perceived risk level at follow-up period, receive information about precautions at follow-up period, redeployed at follow-up period, leaving home for fear of spreading COVID-19 to my family at baseline, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up, GHQ social at follow-up and GHQ total score at baseline.

Multivariate analyses showed that frontline HCW, perceived risk level at follow-up period, receive information about precautions at follow-up period, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up and GHQ depression at follow-up were significantly related to avoidance of reminders of the traumatic event.

Impact on social functioning was predicted by receive information about precautions at follow-up period, leaving home for fear of spreading COVID-19 to my family at baseline, overwhelmed by work at follow-up, GHQ-28 anxiety at follow-up, GHQ social at follow-up and GHQ depression at follow-up.

Multivariate analyses showed that hours of TV viewing at follow-up period, healthy living facilities in the work shift at follow-up period, total score SASR-Q at baseline, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up, GHQ social at follow-up and GHQ depression at follow-up were significantly related to SASR-Q total score.

In the binary regression model, ASD diagnosis at follow-up was predicted by hours of TV viewing at follow-up period, access to screening test at follow-up period, leaving home for fear of spreading COVID-19 to my family at baseline, GHQ-28 somatic at follow-up, GHQ-28 anxiety at follow-up and GHQ social at follow-up. More details of the multivariate analyses are showed in Table 2.

Gender differences in peritraumatic stress reactions

The groups differed significantly in dissociation ($F_{(1246)}$=7.89; p<0.01), hyperarousal ($F_{(1246)}$=6.47; p = 0.01), reexperiencing the traumatic event ($F_{(1246)}$=9.88; p<0.01), avoidance of reminders of the traumatic event ($F_{(1246)}$=9.03;p <0.01), impact on social functioning ($F_{(1246)}$=6.09; p = 0.01) and total score ($F_{(1246)}$=9.79;p = 0.02). Finally, significant time x group interactions were observed in hyperarousal ($F_{(1246)}$=4.28; p = 0.04) as well as in re-experiencing the traumatic event ($F_{(1246)}$=4.58; p = 0.03). More details are exposed in Table 3. See Fig. 1.

Women presented more than two times higher risk of ASD diagnosis at baseline (OR=2.87; 95% CI=1.28–6.43; p = 0.01). However, GEE results revealed no significant effect of gender on the development of ASD at the follow-up period (OR=1.77; 95% CI=0.85–3.66; p = 0.12).

Discussion

The main findings derived from the present work were: i) HCW experienced a significant improvement in peritraumatic stress symptomatology over the follow-up period, ii) there were not significant differences in the prevalence of ASD among HCW between the first and the second time period, iii) proximal factors related to working conditions, fear of contracting the illness, lifestyle and emotional reactions were the most salient predictors of traumatic reactions reported by HCW in November 2020, iv) significant gender differences were found in all stress acute response dimensions as well as in the total score of SASR-Q and v) women showed significantly greater improvement than men in re-experiencing the traumatic event and hyperarousal peritraumatic stress acute responses over the follow-up period.

A significant improvement in peritraumatic stress reactions symptomatology was observed among HCW. In that sense, it has been suggested that people coping with traumatic situations showed significant resilience capacities (Bonanno and Mancini, 2012). However, despite the above-mentioned improvement, the proportion of HCW who met criteria for ASD did not change over the follow-up period. These results may reflect that the impact of COVID-19 on stressful reactions are different from that on more clinically severe conditions. A possible explanation is that HCW experienced a progressive adjustment to the traumatic event by decreasing the impact of the traumatic event on peritraumatic stress reaction (Ayuso-Mateos et al., 2021), although a significant number of workers showed a long-term pattern of ASD development.

Factors occurred over the follow-up period related to working conditions, psychological well-being, lifestyle, fear of COVID-19 disease and its spreading to loved ones represent the most prominent predictors of stress reactions as well as for ASD disorder in November 2020. For instance, fear of loved ones being infected with COVID-19 at the second period are particularly relevant in dissociation dimension which is congruent with previous literature (McDonald et al., 2013).

Working conditions represent one of the main predictors of stress reactions suffered by HCW during the crisis caused by COVID-19 (Boluarte Carbajal et al., 2020). In that sense, we observed that frontline workers as well as those who perceived risk of contagion at work or feel overwhelmed by work are characterized by worse peritraumatic reactions. Organizational issues play also an important role since lack of preventive information to avoid COVID-19 infection over the second period predicted three of the six dimensions analyzed in the present work. In addition, we found that HCW who were redeployed presented more dissociative reactions and reported increased re-experiencing of the trauma events associated with the stressor event. Thus, preventive interventions including administrative and organizational problems should be included to avoid adverse emotional reactions.

Lifestyle plays an important role since media consuming, and specially COVID-19 related news, seems to be strongly associated with anxiety and depression (Neill et al., 2021). Our study confirms that higher consumption of COVID-19 news in November was linked with

Table 3
Changes in peritraumatic stress reactions and ASD over the follow-up period.

	Gender	Baseline	Follow-up period	Time	Group	Time x Group
Dissociation	Female	2.66±2.82	2.21±2.82	$F_{(1246)}$=0.98;p = 0.32	$F_{(1246)}$=7.89;p<0.01	$F_{(1246)}$=2.01;p = 0.16
	Male	1.46±2.41	1.76±2.31			
Hyperarousal	Female	2.97±1.95	2.30±2.07	$F_{(1246)}$=1.19;p = 0.67	$F_{(1246)}$=6.47;p = 0.01	$F_{(1246)}$=4.28;p<0.05
	Male	2.01±1.95	2.14±2.01			
Reexperiencing the traumatic event	Female	1.74±1.99	1.34±2.01	$F_{(1246)}$=2.36;p = 0.13	$F_{(1246)}$=9.88;p<0.01	$F_{(1246)}$=4.58;p = 0.03
	Male	0.72±1.56	1.07±1.66			
Avoidance of remiders of the traumatic event	Female	1.91±2.01	1.48±1.91	$F_{(1246)}$=2.36;p = 0.13	$F_{(1246)}$=9.03;p<0.01	$F_{(1246)}$=2.36;p = 0.13
	Male	1.06±1.54	1.15±1.66			
Impact on social functioning	Female	0.56±0.71	0.47±0.70	$F_{(1246)}$=1.79;p = 0.18	$F_{(1246)}$=6.09;p = 0.01	$F_{(1246)}$=0.32;p = 0.57
	Male	0.33±0.61	0.33±0.61			
Total score	Female	9.84±8.41	7.80±8.66	$F_{(1246)}$=1.60;p = 0.21	$F_{(1246)}$=9.79;p<0.01	$F_{(1246)}$=3.57;p = 0.06
	Male	5.58±7.28	6.46±7.29			

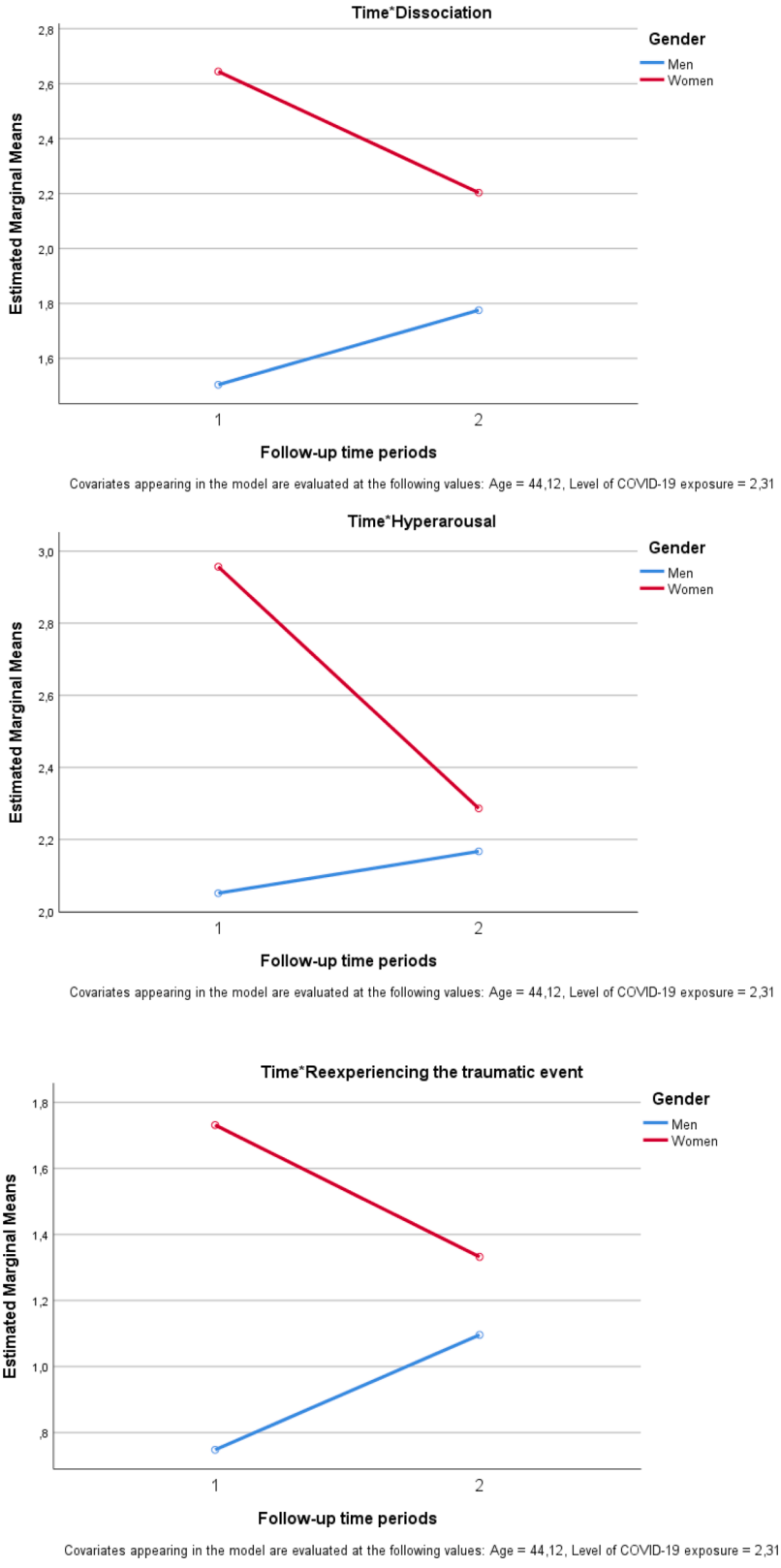
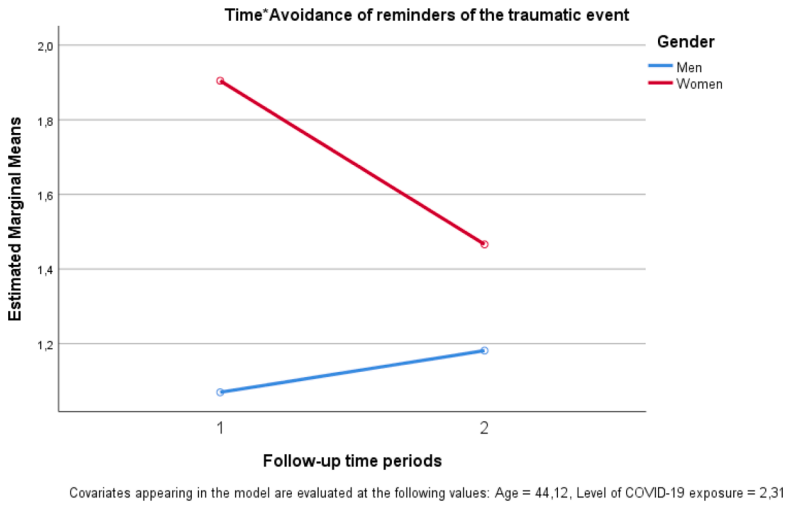
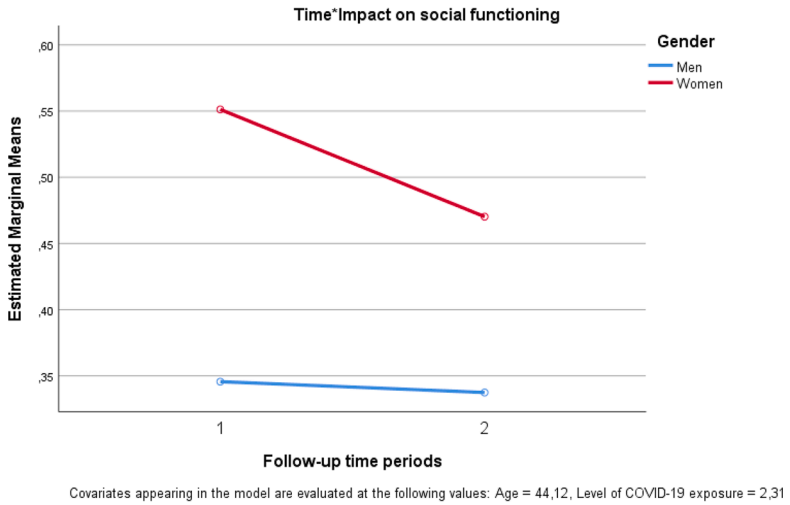


Fig. 1. Estimated Marginal Means of repeated-measures ANOVA.

peritraumatic stress reactions (Yoon et al., 2021). It is worth noting that recreational activity and regular exercise are one of the main protective factors for trauma- and stressor-related disorders (Sultana et al., 2021).

Emotional reactions suffered over the follow-up period are relevant in peritraumatic reactions at the follow-up period. In that sense, anxiety and depressive symptomatology have been strongly linked to trauma- and stressor-related disorders as well as to mental health status of HCW facing COVID-19 crisis (Flory and Yehuda, 2015; Li et al., 2021). In addition, isolation and lack of social support (GHQ-social dimension) have also been suggested to be critical in the improvement of the psychological well-being of HCW facing COVID-19 pandemic (Serrano-Ripoll et al., 2020). On the other hand, posttraumatic stress disorder





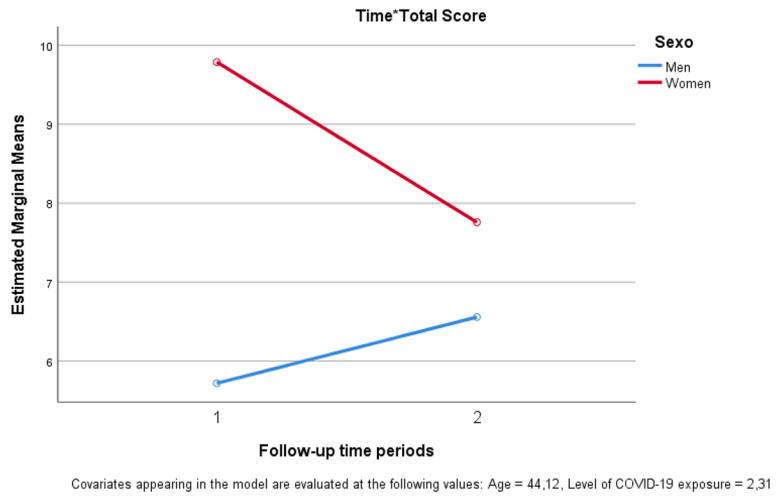


Fig. 1. (*continued*).

appears to amplify somatic symptoms in professionals facing major disasters (Milligan-Saville et al., 2017). Regarding with this, somatic symptoms (GHQ-Somatic dimension) also affect stress reactions, increasing the difficulty of coping with the major disaster.

Multivariate results from our study are consistent with previous publications that have analyzed risk factors for the development of ASD among workers facing major disasters. In particular, somatic and anxiety together with lack of social support represent the main predictors of ASD (Ozer et al., 2003; Sareen, 2014). On the other hand, the media's consumption of pandemic-related news and the lack of access to protective

equipment could imply prolonged exposure to trauma which has been demonstrated to be one of the main risk factors for traumatic pathologies (McFarlane, 2010). Finally, those who moved away from home over the first period may share certain personality traits which could increase the risk of ASD in November 2020 (Ranieri et al., 2021).

Women and men are characterized by different patterns of stress reactions to traumatic events (Mayor, 2015; Verma et al., 2011). Specifically, women are characterized by "tend-and-befriend" while men facing traumatic events have been defined as "fight-or-flight" (Taylor et al., 2000). Our results are in agreement with those studies that reported that women are characterized by higher stress reactions. However, repeated ANOVA analyses and GEE revealed significant gender differences in peritraumatic stress reactions responses. Social support has been recognized as one of the main protective factors against psychological distress (Liu et al., 2021). It is possible that the "tend-and--befriend" mechanism to face stress situations showed by women, could be determinant to explain the improvement observed in HCW women throughout the follow-up period and specially on hyperarousal and re-experiencing dimensions.

Findings from this study have important practical implications. Given that the precipitating factors for the development of stressful peritraumatic symptomatology in HCW who are facing major disasters is due to a complex network of organizational and personal factors, health institutions should endeavor to the development of comprehensive stress contingency plans which contribute to the best possible working conditions for HCW in severe stressful conditions. Moreover, these contingency plans should include preventive mental health support programs as well as the implementation of policies to promote healthy lifestyle habits which could mitigate the impact of COVID-19 on the mental health status of HCW. Finally, this study underlines the relevance of monitoring the potential factors involved in the development of reactive stress responses and ASD as proximal factors resulted the major determinants of stress reactions.

Strengths and limitations

One of the main limitations of the study was the attrition suffered during follow-up period. On the other hand, even though the study included a comprehensive set of risk factors, other variables such as personality traits or psychopharmacology treatment were not considered in the study. Another limitation of the study was that although Spanish validation of SASR-Q was made by Cardeña & Maldonado in 2001, the validation of the questionnaire was not published. It is worth to note that this unpublished validation has been used by a significant number of studies carried out in Spain and the psychometric properties reported by these publications were good. Furthermore, more sophisticated methodology such as growth mixture modeling analyses should be used to explore potential different trajectories as well as predictors of worsening trajectories. Unfortunately, we were unable to carried out these analyses due to the lack of a third monitoring period. Finally, the study presents the limitations inherent to online survey studies such as possible bias in the respondent's answers.

Conclusion

Resilience capacity has been demonstrated by HCW as a significant improvement in peritraumatic symptomatology was observed in the participants of the present study. However, the proportion of HCW who met ASD criteria did not change along the follow-up period which could means that a significant proportion of HCW are characterized by a long-term pattern of ASD onset. Moreover, the most prominent predictors of ASD and peritraumatic stress reactions are those related to working conditions, fear of contracting the illness, lifestyle and emotional reactions occurred over the follow-up period. Thus, in the light of the results and as was noted above, intervention policies should be implemented to improve the working conditions of HCW as well as continued access to mental health care programs specifically designed for the prevention and promotion of emotional well-being and the acquisition of healthy lifestyle habits in HCW coping with major disasters. On the other hand, we found significant gender differences in stress acute responses over the follow-up period. Regarding with this aspect, women experienced significant improvements in some of the main dimensions of peritraumatic stress reactions over the follow-up period which could be explained by the "tend-an-befriend" coping style to stress situations. Further studies are required to confirm the results of the present work.

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Author contributions

MCR: Study conception, design, processing data, analysis, drafting and manuscript revision. LAL: Data acquisition, processing data and psychometric tests descriptions. ARG: Data acquisition and Table 1. GRM: Data acquisition and Table 1. NGT: Manuscript revision. LC: Manuscript revision. AL: Manuscript revision. BCF: Study conception, design and manuscript revision. MRV: Study conception, design and manuscript revision. All authors have made substantial contributions and have approved of the final version of the manuscript.

Declaration of Competing Interest

The authors declare that there are no conflicts of interest in relation to the subject of this study.

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