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Cross-Sectional Study of the Psychological Well-Being of Healthcare Workers in a Large European University Hospital after the COVID-19 Initial Wave

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Abstract

Background: *The SARS-CoV-2 pandemic greatly impacted healthcare workers (HCWs) dedicated to COVID-19 patients. A cross-sectional investigation was conducted in a large European hospital to study the psychological distress of HCWs engaged in COVID-19 wards in the early phase of the pandemic.* **Methods:** *A questionnaire was sent to 1229 HCWs to collect the following information: i) sociodemographic data; ii) depression, anxiety, and stress scales (DASS-21); iii) event impact scale (IES-R); iv) perceived stress scale (PSS); and v) work interface analysis. Regardless of the outcome of the questionnaire, all subjects were offered psychological support voluntarily.* **Results:** *Approximately two-thirds of the workers reported no symptoms according to the DASS-21 scales, the corresponding figures for the IES-R and PSS scales being 36% and 43%, respectively. There were no differences in the levels of depression investigated through the different scales in the various occupational categories. Symptoms of anxiety, stress, and depression were more pronounced in women, whereas the highest stress levels were observed in the younger age groups. The highest scores were observed on the DAS-21 scales of anxiety and IES-R but not on the others. Only 51 workers, most with previous SARS-CoV-2 infection, sought clinical psychological counseling, and more than half received subsequent psychological support. Conclusions. Our results agree with most of the literature data that anxiety, depression, and stress are associated with gender (female), age (18-44 vs. over 55), and having cared for patients with COVID-19.*

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1. Introduction

The COVID-19 pandemic has been a traumatic event apart from the clinical consequences of infection on the psycho-emotional level of the general population and of specific categories professionally engaged in caring for SARS-CoV-2 patients.

Numerous studies have investigated the effects of the pandemic on the psychological condition of the general population [1, 2, 3] and on HCWs [4, 5, 6, 7]. According to a systematic literature review published through April 2020, anxiety was evaluated in 12 studies, with an overall prevalence of 23-2%, and depression was evaluated in 10 studies, with a prevalence rate of 22-8%. Female gender and nurses have higher rates of symptoms than males and medical staff, respectively. Insomnia prevalence was estimated at 38.9% across 5 studies [6].

In another systematic review in women and nurses, more frequent levels of moderate and severe levels of stress, anxiety, depression, sleep disturbance, and burnout were described. No significant age-related differences were observed. [8]. In a multicenter study conducted during the first pandemic wave on 906 employees from 6 hospitals by questionnaire collecting the prevalence of symptoms in the past month, the Depression Anxiety Stress Scales (DASS-21) [9] and the Impact of Events Scale-Revised (IES-R) [10] instrument, anxiety was detected in 5.3% of subjects, moderate to very severe depression in 8.7%, and moderate to extremely severe stress in 2.2% [11].

In another review, severe symptoms of stress, depression, and anxiety were recorded in 2.2%-14.5% of subjects with higher intensity with age, gender, occupational specialty, and frontline care of COVID-19 patients. The following mediating variables have been described: staff selection, preventive interventions, resilience, and social support [12].

The main factors described in the literature that contribute to increased physical and mental fatigue, anxiety, stress, and burnout of HCWs are limited hospital resources, fear of infection at work, longer shifts, son rhythms, work-life balance, consequent heightened dilemmas regarding patients' duties versus fear of family members' exposure, neglect of personal and family needs with increased workload, and lack of sufficient communication and up-to-date information [7].

Our work was carried out on workers of a socio-health territorial company in the Lombardy Region of Italy to assess the conditions of psychological distress experienced during the first SARS-CoV-2 pandemic phase.

2. Methods

This cross-sectional study was conducted in the period May-September 2020 at the *ASST Spedali Civili* of Brescia, one of the largest university hospitals in Italy, employing more than 8,000 workers and admitting more than 2000 COVID-19 patients in the period 15/02/2020-31/05/2020. The inclusion criterion to participate in the study was working in COVID-19 wards. The starting sample included 2,500 workers employed in both hospital and territorial services dedicated to the care of patients affected by SARS-CoV-2, including physicians, nurses, obstetricians, support workers, psychologists, office workers, and other health professionals (biologists, functional rehabilitation technicians, laboratory technicians, radiologists, etc.). Workers were recruited by e-mail, including a questionnaire that investigated the following areas: i) Sociodemographic data; ii) Depression, Anxiety, and Stress scale (DASS- 21) [9]; iii) Impact of event scale-revised (IES-R) [10]; iv) Perceived Stress Scale (PSS) [13, 14]; v) Work interface. The e-mails were sent to every worker in May, and further monthly e-mails were sent as recalls in June, July, and August to non-responders. Each enrolled worker gave his informed consent, compiled the questionnaire, and could express his interest, if any, in receiving counseling and psychological support from hospital psychologists and psychotherapists. The study adhered to the Ethical Principles of the Helsinki Declaration. In contrast, approval by the local Ethics Committee was unnecessary, as the study was performed as a health promotion activity in the context of mandatory Occupational Health Surveillance. The survey included the following validated self-administered questionnaires. For each scale, workers were asked to refer replies to the first wave of the COVID-19 emergency.

Depression Anxiety Stress Scales 21 (DASS-21) [9] is a 21-item self-report questionnaire that measures depression, anxiety, and stress symptoms, with seven items for each subscale. The scale is divided into five severity levels of depression, anxiety, and stress: normal, mild, moderately severe, and extremely severe. The cutoffs are different for anxiety, stress, and depression. The depression scale assesses devaluation of life, self-evaluation, hopelessness, lack of interest/involvement, dysphoria, inertia, and anhedonia; the anxiety scale assesses autonomic arousal, situational anxiety, musculoskeletal effects and subjective experience of anxious affect; and the stress scale assesses tension and irritability. Each item can have scores ranging from 0 to 3, while the sum for each subscale can vary from 0 to 21, with higher scores indicating higher levels of depression/anxiety/stress. For the depression subscale, none ranges from 0 to 9, mild 10 to 13, moderate 14 to 20, severe 20 to 27, and extremely severe > 28; for anxiety, none 0 to 7, mild 8 to 9, moderate 10 to 14, severe 15 to 19, extremely severe > 20; for stress, none is 0 to 14, mild 15 to 18, moderate 19 to 25, severe 26 to 33, extremely severe > 34.

The Impact of Event Scale-Revised (IES-R) [10] is a 22-item self-report questionnaire that studies the psychological impact of a stressful event. The IES-R comprises three subscales assessing intrusion (8 items), avoidance (8 items), and hyperarousal (6 items) symptoms. For this survey, participants had to refer to the COVID-19 emergency. IES-R items range from 0 to 4 (0 - not at all, 1 - a little bit, 2 - moderately, 3 - quite a bit, 4 - extremely), with a total score ranging from 0 to 88. Higher scores indicate higher subjective distress symptoms. For the IES-R scale, if the subject indicates scores of 0, 1, and 2 in any item, the impact of the events has no clinical value (score 0). On the other hand, if the subject indicates scores of 3 or 4 in fewer than three avoidance items, in no intrusiveness items, and in fewer than two hyperarousal items, the impact of events has subclinical value (score 1). When the subject indicates scores of 3 or 4 in some items in one of the three clusters and the other two have subclinical value or indicate scores of 3 or 4 in two of the three clusters, the impact of events has clinical value (score 2).

Perceived Stress Scale (PSS): [13] is a 10-item self-report questionnaire designed to measure the subjective perception of stress. It measures the degree to which life situations are appraised as stressful, asking about feelings and thoughts during the last month. PSS items range from 0 to 4, with a total score ranging from 0 to 40. Higher scores indicated higher subjective perception of stress. The sum of the scores for each item leads to the calculation of 3 stress levels: none (0-13 score 1), mild stress (14-26, score 2), and stress overload (27-40, score 3).

Workers were also asked to respond to specific items related to content data and work context, listed in Table 5, to which they attributed greater feelings of subjective discomfort.

Data collected via Google® forms were imported into Microsoft-Excel® and then into IBM-SPSS® software ver. 26.0.1. The normality of continuous variables was evaluated by the Kolmogorov–Smirnov test. After descriptive variable analyses, we performed χ^2 and Fisher's exact test analyses. Associations between variables in more than 2x2 tables were evaluated by the standard residual method, considering residuals as significant if higher than 1.96 in absolute value (z in the normal distribution). Spearman's correlation analysis was run to verify relationships among scores obtained at the different scales.

Nominal regressions were then performed, always setting as dependent variables Y (outcome) the psychological scale scores and as independent variables (predictors) gender, age groups, occupational category, taking care of COVID-19 patients, and previous COVID-19. Simple and multivariable models were run to calculate crude and adjusted odds ratios (ORs) and 95% confidence intervals (95% CI). All results were tested at the α significance level of 5%.

3. Results

A total of 1,229 workers completed the questionnaire and were enrolled in the study, with a response rate of 49,2%. The main characteristics of enrolled subjects are summarized in Table 1.

In both sexes, the age groups 30-44 and 45-54 years were more represented, with a significant prevalence of males in the first group and of females

Table 1. Distributions of main characteristics in the whole sample and after stratification by gender. Bold characters refer to figures significantly different between groups in the χ^2 test.

	Whole Sample		Males		Females	
Characteristics	**N**	**%**	**N**	**%**	**N**	**%**
Subjects	1,229	-	290	23.6	939	76.4
Age Groups*						
18-29 ys.	165	13.4	30	10.3	135	14.4
30-44 ys.	396	32.2	108	37.3	288	30.7
45-54 ys.	473	38.5	99	34.1	374	39.8
> 55 ys.s	195	15.9	53	18.3	142	15.1
Job Titles***						
Administrative Clerks	26	2.1	5	1.7	21	2.2
Support HCWs	248	20.2	37	12.7	211	22.5
Nurses	638	51.9	135	46.6	503	53.6
Physicians	241	19.6	98	33.8	143	15.2
Other Health Professions	76	6.2	15	5.2	61	6.5
Previously Affected by COVID-19						
No	966	78.6	220	75.9	746	79.4
Yes	263	21.4	70	24.1	193	20.6
Working in a COVID-19 Ward						
Yes	1,020	83	247	79.7	773	84.1
No	209	17	43	20.3	166	15.9

**p<0.05; ***p<0.0001.*

Table 2. Distribution of DASS-21 scale scores in the enrolled sample, stratified by sex. Bold characters indicate the subgroups showing significant differences in the χ^2 test analysis.

	DASS-21 Depression					DASS-21 Anxiety					DASS-21 Stress				
	M		F**		Both	M		F***		Both	M		F*		Both
Score	**N**	**%**	**N**	**%**	**%**	**N**	**%**	**N**	**%**	**%**	**N**	**%**	**N**	**%**	**%**
1. None	222	76.5	616	65.6	68.3	244	84.2	666	70.9	74.0	213	73.3	592	63.0	65.5
2. Slight	33	11.4	115	12.2	12.0	13	4.5	62	6.6	6.1	28	9.7	124	13.2	12.4
3. Moderate	22	7.6	131	14.0	12.4	25	8.6	121	12.9	11.9	24	8.3	120	12.8	11.7
4. Severe	7	2.4	35	3.7	3.4	1	0.3	39	4.2	3.3	17	5.9	78	8.3	7.7
5. Extremely Severe	6	2.1	42	4.5	3.9	7	2.4	51	5.4	4.7	8	2.8	25	2.7	2.7

**p<0.05; **p<0.005; ***p<0.0001.*

in the second group. The distributions between genders were also significantly different for job titles (p<0.0001), as support HCWs prevailed among females, whereas physicians prevailed among males.

Table 2 presents the results of the DASS-21 scale in the whole sample as well as after stratification by sex. Females obtained significantly worse results in the three scales, especially in the anxiety scale (p<0.0001).

Table 3. Distributions of the IES-R and PSS scale in the enrolled sample, stratified by sex Bold characters, indicate subgroups showing significant differences (by gender) in the chi-square test analysis.

IES-R	Whole Sample		Males		Females***	
Scale, Score	N	%	N	%	N	%
0 (Impact of Events has No Clinical Value)	441	36	156	54	285	30
1 (Impact of Events has Subclinical Value)	584	47	108	37	476	51
2 (Impact of Events has Clinical Value)	204	17	26	9	178	19
PSS Scale, Score						
1 (No Stress)	528	43	170	59	358	38
2 (Mild Stress)	624	51	112	39	512	55
3 (Stress Overload)	77	6	8	2	69	7

****p<0.0001.*

The results of the IES-R and PSS scales are summarized in Table 3, again in the whole sample and after stratification by gender. Again, females showed the worst results on the IES-R, with a significant trend across the scale's severity levels (p<0.0001). In contrast, no significant difference was observed on the PSS scale according to sex.

Then, we verified the correlations among different scale scores, and the results are summarized in Table 4. The obtained scores were well correlated with each other in a highly significant manner (p<0.0001), with *rho* values ranging from 0.39 to 0.64.

Nominal l regression analyses investigating the associations between scale scores and individual variables were then performed calculating both crude (one-by-one analyses) and adjusted (multivariable analyses) ORs and 95% CI.

We obtained some significant associations, which are reported in Table 5, showing the importance of

Table 4. Results of the Spearman's correlation analysis among the scores scale obtained with different scales.

	Das-21 Depression	Das-21 Anxiety	Das-21-Stress	IES
Das-21 Anxiety	0.58***			
Das-21 Stress	0.64***	0.58***		
IES-R	0.39***	0.42***	0.47***	
PSS	0.53***	0.46***	0.56***	0.43***

****p< 0.001.*

sex and age as main factors affecting the scores of different scales. Females and younger age groups showed significant associations with higher severity scores in the three DASS-21 domains, as well as in the IES-R and PSS scales. Assistance in COVID-19 wards showed a significant association with the DASS-21 anxiety and IES-R scales.

Regarding the opinion of workers about the main work content and context elements affecting their wellbeing, Table 6 shows the frequencies of answers in descending order. The main elements affecting psychological workers' health were the fear of contagion, organization of work, sense of helplessness in the face of patients' death and workload. In the subgroup of HCWs requiring psychological counseling, similar distributions were found, but higher relevance was observed for "relationships with organization".

Fifty-one (13 M, 38 F) HCWs required clinical psychological counseling. Twenty-two workers had only one psychological interview, and 29 were taken in for ongoing psychological support.

4. Discussion

The present study was performed at the end of the first COVID-19 pandemic phase in a large Italian hospital at the epicenter of the pandemic spread in Europe. In the early phase of the COVID-19 pandemic, digital resources such as online questionnaires published in the enterprise intranet allowed the Occupational Health Unit to manage hundreds of COVID-19 infections and contact tracing, thus overcoming the scarce resources available [15]. In

Table 5. Results of multinomial regressions. The results are expressed as odds ratios (ORs) and 95% Confidence Intervals (95% CI). Both crude (OR) and adjusted ORs (^{adj}OR) were calculated.

Score	Scales	OR	95% CI	^{adj}OR	95% CI
DASS-21 DEPRESSION					
1	*1 (Ref)*				
2	*No Association*				
3	Gender: F *vs* M	2.15**	1.33-3.46	2.06*	1.27-3.35
4	Age: 18-29 *vs* > 55 y	10.99*	1.37-88.06	10.54*	1.28-86.98
	Age: 45-54 *vs* > 55 y	8.54*	1.13-64.44	9.07*	1.19-69.21
5	Gender: F *vs* M	2.52*	1.06-6.02	3.01*	1.24-7.32
DASS-21 ANXIETY					
1	*1 (Ref)*				
2	*No Association*				
3	Gender: F *vs* M	1.77*	1.13-2.80	1.56	0.98-2.48
	Age: 18-29 *vs* > 55	2.48**	1.34-4.60	2.47*	1.29-4.74
4	Gender: F *vs* M	14.29*	1.95-104.56	13.23*	1.80-97.39
	COVID-19 Ward (Yes *vs* No)	8.45*	1.15-61.93	9.73*	1.28-73.85
5	Gender: F *vs* M	2.67*	1.20-5.96	2.47*	1.09-5.57
DASS-21 STRESS					
1	*1 (Ref)*				
2	Gender: F *vs* M	1.59*	1.03-2.47	1.63*	1.04-2.56
	Age:18-29 *vs*>55 y	2.72**	1.42-5.24	2.18*	1.10-4.33
	Age: 30-44 *vs*>55y	2.07*	1.14-3.73		
3	Gender: F *vs* M	1.80*	1.13-2.87	2.04**	1.26-3.30
4	Gender: F *vs* M	1.65	0.96-2.85	1.84*	1.05-3.22
5	Age: 18-29 *vs* > 55	4.22*	1.11-15.97	5.24*	1.29-21.29
IES-R					
0	*1 (Ref)*				
1	Gender: F *vs* M	2.41***	1.81-3.21	2.58***	1.91-3.47
2	Gender: F *vs* M	3.75***	2.38-5.91	3.92***	2.45-6.25
	Age: 45-54 *vs*>55y	2.24**	1.31-3.85	2.02*	1.16-3.52
	COVID-19 Ward (Yes *vs* No)	2.50**	1.48-4.22	2.84***	1.60-5.06
PSS					
1	*1 (Ref)*				
2	Gender: F *vs* M	2.17***	1.65-2.86	2.20***	1.66-2.93
	Age 18-29 *vs* > 55	1.64*	1.06-2.53	1.40	0.88-2.21
	Age 30-44 *vs* > 55	1.60*	1.13-2.28	1.50*	1.03-2.19
3	Gender: F *vs* M	4.10***	1.93-8.71	4.48***	2.08-9.65
	Age 18-29 *vs* > 55	3.04*	1.22-7.60	2.81*	1.07-7.35

Table 6. Distributions in descending order of items judged by workers as determinants of their psychological health.

	Whole Sample		Psychological Counseling	
Content and Context Items	**N**	**%**	**N**	**%**
Fear of Contagion	521	42	22	43
Organization of Work	444	36	20	39
Sense of Helplessness in Face of Death of Sick Person	444	36	19	37
Workload	439	36	18	35
Reconciliation of Work and Family	361	29	14	27
Change of Activity in Ward (Transformed into a COVID-19 Ward)	321	26	8	16
Fear of Not Caring Adequately	271	22	11	22
Shifts and/or Schedules	144	12	4	8
Relationship with Organization	143	12	13	25
Change of Department	98	8	1	2
Relationship with Colleagues	91	7	5	10
Other Issues	71	6	3	6
No Spect	20	2	1	2

that phase, the enterprise intranet was the main communication channel about preventive emergency measures to spread to HCWs, who gradually began to use it with increasing confidence.

Based on such premises and the limited available resources, eager to know the mental health status of our operators, we decided to perform the psychological survey again based on online questionnaires sent by e-mail to the target population. We knew such an approach was prone to several biases, including selection bias and uncertain data quality. Nevertheless, we believed this was the only way to approach such a relevant issue.

To better characterize the psychological impact of the pandemic on the psychological sphere, we decided to administer three different scales to investigate behavioral and emotional symptoms in our study group. The DASS-21 scale investigates the levels of depression, anxiety, and stress, whereas the IES-R scale investigates stress-related symptoms, and the PSS scale allows a rating of perceived stress.

The DASS-21 scale demonstrated slightly higher levels of stress and depression compared to anxiety, with figures of approximately 30% and 25%, respectively. The three symptoms significantly prevailed among females for depression and stress at a moderate level. In contrast, the prevalence was significant for anxiety in the medium to severe and extremely severe grades.

Regarding the IES-R scale, stress-related symptoms again prevailed significantly among females, particularly at level 2 (clinical significance), where the prevalence was more than double that of males. Similar results were observed with the PSS scale, where the last figure was approximately triple in females *vs* males. The scale scores were highly related, demonstrating good concordance.

In further nominal multivariate analyses, a higher susceptibility of females to symptoms recorded through the DASS-21 scale was confirmed, as well as a higher risk for younger (in particular the 18–29-year group) *vs* older subjects (older than 55 years). Delivering care in a COVID-19 ward was a further risk factor for anxiety symptoms. All such factors (female gender, 30-44 age group, and providing care in a COVID-19 ward) also played a role in stress-related symptoms revealed by the IES-R scale. In contrast, on the PSS scale, worse scores were associated with female sex and younger age.

Only 51 workers of the sample under analysis accepted the proposal of further clinical psychological counseling, 70% of whom had previously contracted COVID-19. Apart from this, the symptoms at the different scales were similar to the rest of the sample group (data not shown). Twenty-two received only psychological counseling, whereas 29 were in charge of further psychological support.

The main factors of the work environment affecting the workers' well-being resulted in decreasing order: fear of contagion, workload, organization, and sense of helplessness *vs* COVID-19 patients. The subset of HCWs who required psychological counseling judged the work similarly but showed the worst relationship with the organization.

This contribution, although with the limitations represented using self-administered questionnaires sent by e-mail and the cross-sectional study design, was conducted on a vast population of HCWs (1,229 workers). The impact of the pandemic led to the development of stress symptoms, anxiety, and depression of varying levels in approximately 30% of HCWs employed in the inpatient wards of COVID-19 patients, with stress symptoms of higher magnitude than anxiety and depression. The obtained results are consistent with literature data on the same topic, with recent reviews highlighting the role of age and gender as the main factors affecting the risk of developing symptoms of anxiety, depression, and stress. Most studies agree in showing a higher risk among females and as a function of age (higher in younger subjects) [6, 3, 12, 16, 17].

On the other hand, our results seem to disagree with some literature studies [6, 12, 16] that show a higher prevalence of psychological effects in nurses and support workers. Our research found no statistically significant association between psychological disorders and professional categories in multivariable analysis. Furthermore, in other studies [7,18], health workers attribute fatigue and stress to excessive workload and organization; however, in our research, they were more likely to fear infection.

Our sample showed little inclination to seek psychological support; only 51 workers agreed to psychological counseling, most of whom had previously contracted SARS-CoV-2 infection. We cannot exclude that such an event can have conditioned their option, as it is known that COVID-19 can leave clinical sequelae, including psychological symptoms [19, 20, 21]. We cannot exclude the possibility of missed workers undergoing psychological counseling or support on their own, outside our hospital, for privacy reasons. On the other hand, most HCWs did not seek psychological help during the entire emergency period, which may be explained by the challenging conditions in which they lived, personally and professionally.

The concordance between the DASS-21, IES-R, and PSS scales shows that they are valuable tools that can be used to study pandemic events. At the same time, the differences recorded in the description of the extent of symptoms can be explained by differences in the rationale and sensitivity of the different scales in recording the symptoms themselves.

We are aware that our study, performed by online questionnaires, was potentially affected by selection bias and inaccuracy due to a lack of control of data quality, potentially affecting the overall data quality and reliability. Nevertheless, the obtained data substantially agreed with comprehensive literature on the same topic, indirectly supporting an acceptable rate of collected data.

The study modified the questionnaire instructions by requiring participants to refer to events that occurred approximately three months earlier and not the previous week. This may have increased recall bias and affected the results.

5. Conclusion

Our study shows the presence of symptoms of stress, anxiety, and depression of varying levels in approximately one-third of HCWs employed in the care of COVID-19 patients, with symptoms influenced by factors such as age and gender, in agreement with previous literature studies. Mental health-informed accompanying interventions are needed to facilitate HCW coping [6, 12, 22].

Our results highlight the need for rapid interventions (psychological and organizational) to reduce psychological distress among HCWs, as just proposed in the literature [23]. Given the low propensity for psychological intake evidenced by HCWs, it is crucial to respect workers' wishes regarding the type, timing, and content of such interventions (e.g., individual psychological counseling with a therapist or a support group with other HCWs, organizational interventions at work with attention to shifts, rests or departmental changes, and incentives to take vacations).

The study was performed in the months immediately following the development of the COVID-19

pandemic; therefore, longitudinal follow-up studies will be necessary to evaluate the trend over time and the developmental trajectories of anxious, depressive, and stress-related symptoms in the HCW population, as well as to identify risk and protective factors in the long term.

Informed Consent Statement: The study was conducted according to the guidelines of the Declaration of Helsinki. Ethical review and approval were waived for this study, as it was performed in the health surveillance of workers in the occupational context, which is compulsory according to the Italian Decree 81/2008. Patient consent was waived due to the reasons explained above. Data were treated according to the Italian Legislative Decree 196/2003 and the EU Regulation 2016/679.

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Conflicts of Interest: The authors declare no conflict of interest.

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