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ORIGINAL ARTICLE IN OCCUPATIONAL HEALTH

Need for psychological support and disability management programs during and after the COVID-19 pandemic in Italy: Preliminary findings from a hospital-based occupational health surveillance program

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Abstract

Introduction: Since the beginning of COVID-19 pandemic, healthcare workers (HCWs) have undoubtedly experienced overwhelming levels of strain associated with social and occupational stressors. This study aimed to investigate the potential psychological effects experienced by hospital workers and HCWs and their associated demographical and occupational characteristics during the COVID-19 pandemic.

Methods: A cross-sectional study was carried out in a public hospital in Rome, Italy, from June 2020 to July 2021. 635 hospital workers (HCWs, administrative and technicians) were enrolled in the study. The "Psychological Injury Risk Indicator" questionnaire was used. Statistical analyses have been made using Student's T test for categorical binomial variables and analysis of variance for multi-categorical variables. Logistic regression analysis was then performed.

Results: 30.6% of the sample was at risk for general psychological impairment; reduced energy recovery was found in 48.0% and sleep problems in 44.7% of them. Female workers reported a two-fold risk for potential psychological impairment compared to male colleagues. Nurses presented a three-fold risk while physicians a two-fold risk for the overall score. Additionally,

physicians had a four-fold risk to develop a lack of energy recovery and a three-fold risk for chronic fatigue. Technicians showed a significant double risk for sleep problems and chronic fatigue as well as a three-fold risk for reduced energy recovery. Administrative personnel reported a tendency on sleep problems. Interestingly, agile working was a two-fold protecting factor. No-night shifters have a half risk for reporting problems in energy recovery.

Discussion and Conclusion: The measure of agile working is effective to mitigate the impacts of COVID-19 on mental health by protecting and promoting the psychological wellbeing of HCWs during and after the outbreak.

KEY WORDS: COVID-19; burnout syndrome; mental health; PTSD; occupational health surveillance; work-related stress.

TAKE-HOME MESSAGE: This study showed some differences in the occurrence of potential psychological effects among HCWs in terms of gender and professional category. As part of COVID-19-specific disability management program, agile working may be a protecting factor for mental health during the COVID-19 pandemic. Further studies are required to better clarify these aspects.

Competing interests: none declared

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INTRODUCTION

Since the beginning of COVID-19 pandemic, healthcare workers (HCWs) have undoubtedly been experiencing overwhelming levels of strain associated with social and occupational stressors [1–3]. Psychological impact of pandemics has been widely observed in the past, particularly for frontline HCWs who particularly feel the extreme pressure of being victim of the virus or the main source of SARS-CoV-2 transmission for their families as well as for users [4].

In disaster medicine, uncontrolled emotional distress has been reported to cause acute stress, which may lead to post-traumatic stress disorder (PTSD) in a relatively short term [4]. PTSD has been described in 10% of survivors after flood or pipeline explosion [5, 6], in 20% of the population facing a fire disaster [7] and up to 30-50% after health disasters such as pandemics [8]. To date, after over one year and a half from the COVID-19 outbreak, psychiatric illnesses have been observed growing up worldwide in the workplace, including anxiety, depression and burnout syndrome [3, 9–14]. Recently, an in-depth characterization of COVID-associated PTSD highlighted the mediating role of hyperarousal rather than avoidance in the relationship between intrusive thoughts and mental health disorders [15]. Current evidence from literature highlights the relevance of some determinant factors for PTSD experienced during COVID-19 pandemic, including exposure level, working role, years of work experience, social and work support, job organization, quarantine, young age, gender, marital status, and coping styles [16]. Beyond the threat of occupational exposure to the virus, other elements affect mental health (e.g., longer shifts, increased workload and a general lack of sufficient communication and updated information), which are extremely important especially during pandemics [17]. These factors are

crucial in health care settings, because they can influence the quality of care and assistance for the community as well as increasing absenteeism [18, 19]. In a Spanish cohort, the profile of a HCW with higher levels of PTSD symptoms has been outlined in a woman who was concerned about her cohabitant's high risk of infection [20].

Furthermore, a common perception is that sleep problems among the general population as well as among workers have worsened during the COVID-19 pandemic, more than during the MERS outbreak [21]. As shown in a Turkish population study, the current risk profile for poor sleep quality was being a poorly-educated, unmarried subject with COVID-19-related occupational problems (e.g., losing job during the epidemic period, working in the health sector, not being employed) [22]. No different proportions have been found between nurses and physicians who directly face COVID-19 patients (around 40%) [23]. In addition, being female has been found to be a moderator in a meta-analysis, as it seems associated with fewer sleep disorders [24]. Therefore, this study aimed to investigate the potential psychological injury experienced by hospital workers including HCWs and their demographical and occupational characteristics during the COVID-19 pandemic in Italy.

METHODS

Study population and setting

A cross-sectional study was set in a public hospital in Rome from June 2020 to July 2021. Dependent workers of the hospital were randomly invited to participate to the study prior the health surveillance visit through the fulfilment of a self-administered questionnaire. A sampling of 635 subjects were selected over 2,800 (22.7% of the entire hospital working population).

None of the participants were previously diagnosed with SARS-CoV-2 infection (four of them get infected after the considered period).

The Questionnaire

The *"Psychological Injury Risk Indicator"* (PIRI) is a 26-item questionnaire, which investigates mental health and work-related psychological injury [25]. Each question is graded on a Likert (0–6) point scale. The Italian version was used [26]. Reliability analysis of PIRI and its subscales showed a Cronbach's alpha of .928 for this study. Given the mandatory abstention from alcohol at work for HCWs by Italian legislation [27], four of the original five subscales were considered, including sleep problems (6 items), energy recovery (5 items), PTSD symptoms (10 items), and chronic fatigue (5 items). The total score is computed as the sum of each subscale score and then standardized into a 0–100 scale. According to the original guidelines, overall scores major than 25 corresponds to potential psychological injury, while higher scores indicated a greater risk of injury [25]. Questionnaires with missing data were excluded from the study.

Studied variables

Beyond demographic variables (age and gender), occupational variables were considered, including seniority, professional categories (nurses, physicians, technicians, and administrative personnel), commuting, night shifts, and agile working. The latter concerns the opportunity to work at home for more susceptible workers who are at high risk of serious sequelae and mortality in the event of SARS-CoV-2 infection because of a chronic disabling disease (the so called 'frail health status'). This further measure belongs to the COVID-19 specific disability management program carried in the hospital during the pandemic.

Ethical aspects

Our study follows the principles of the Declaration of Helsinki. According to the guidelines on Italian observational retrospective studies, an independent Ethics Committee (EC) approved the study (protocol number 2000/2019). Informed consent was obtained from all the participants.

Data analysis

Statistical analyses have been made using Student's T test for categorical binomial variables and Analysis of Variance (ANOVA) for multi-categorical variables. Logistic regression analysis was then performed assessing the extent of the impact of the considered variables on PIRI scores (both total and subscales). Two models were proposed for each score, evaluating the contribution of agile working in the score prediction for the second model. Data were analysed using the IBM Statistical Package for Social Sciences, SPSS, version 26.0 statistical software.

RESULTS

Demographic and occupational characteristics of the studied population are reported in Table 1.

Table 1. Demographics characteristics of the studied population.

Age (mean ± SD)		43.88 ± 12.11
Seniority (mean ± SD)		14.18 ± 11.35
Gender (n, %)	*Female*	438 (69.0%)
	Male	197 (31.0%)
Professional category (n, %)	*Nurses*	195 (30.7%)
	Physicians	147 (23.1%)
	Technicians	158 (24.9%)
	Administrative personnel	135 (21.3%)

Night shifts (n, %)	*No*	423 (66.6%)
	Yes	212 (33.4%)
Commuting (n, %)	*No*	562 (88.5%)
	Yes	73 (11.5%)
Agile working (n, %)	*No*	506 (79.7%)
	Yes	129 (20.3%)

Mean PIRI total scores resulted below the cut-off for psychological impairment indicated in the guideline [25] (Table 2a). Conversely, subscales analysis highlighted sleep problems and a lack of energy recovery, especially for female workers (score differences of 9.88 and 9.30 respectively between males and females, $P \leq .001$). Surprisingly, commuters had better scores than non-commuters, especially for energy recovery subscale ($P \leq .001$) and sleep disturbances ($P \leq .01$). Night shifts negatively influenced energy recovery ($P \leq .001$) more than sleep problems ($P \leq .01$). Finally, agile workers recorded unexpectedly better scores in all subscales ($P \leq .001$), especially those concerning sleep problems and energy recovery parameters. All categories of HCWs (nurses, physicians, technicians) reported significantly higher values in comparison with administrative personnel (in decreasing order: energy recovery, sleep problems, and PTSD subscales, $P \leq .05$). ANOVA post-hoc test (Bonferroni) emphasized some interesting aspects on subscales (Table 2a). Nurses experienced sleep problems and PTSD more than all other workers, while energy recovery was not differently reduced between nurses and physicians. Physicians mostly perceived chronic fatigue, even if not up to the standardized cut-off for a recognized psychological impairment on average. Among all subscales administrative personnel reported a tendency on sleep problems.

Table 2a. PIRI mean scores (total and subscales).

		PIRI total score *(mean ± SD)*	**Sleep problems subscale** *(mean ± SD)*	**Energy recovery subscale** *(mean ± SD)*	**PTSD subscale** *(mean ± SD)*	**Chronic fatigue subscale** *(mean ± SD)*
Total		19.50 ± 15.94	27.83 ± 22.71	32.03 ± 28.16	20.55 ± 22.34	20.66 ± 21.56
Gender	*Female*	21.55 ± 16.76 ***	30.89 ± 23.67 ***	34.92 ± 29.3 ***	23.21 ± 24.03 ***	22.33 ± 22.62 ***
	Male	14.93 ± 12.86 ***	21.01 ± 18.77 ***	25.62 ± 24.32 ***	14.63 ± 16.63 ***	16.94 ± 18.53 ***
Professional categories	*Nurses*	25.20 ± 16.68 *	35.81 ± 24.06 *	42.24 ± 29.22 *	27.51 ± 24.42 *	23.91 ± 22.42 *
	Physicians	21.08 ± 15.20 *	28.31 ± 21.82 *	39.12 ± 27.77 *	19.81 ± 21.10 *	25.06 ± 21.83 *
	Technicians	17.63 ± 14.48 *	25.63 ± 20.53 *	28.02 ± 24.70 *	18.18 ± 21.06 *	20.08 ± 21.62 *
	Administrative personnel	11.71 ± 13.65 *	18.33 ± 20.02 *	14.27 ± 20.46 *	14.07 ± 19.33 *	11.83 ± 17.02 *
Commuting	*No*	20.14 ± 16.12 ***	28.58 ± 22.89 **	33.35 ± 28.52 ***	21.33 ± 22.82 *	21.13 ± 21.7
	Yes	14.53 ± 13.57 ***	22.03 ± 20.51 **	21.87 ± 22.99 ***	14.57 ± 17.26 *	17.03 ± 20.27
Night shifts	*No*	18.18 ± 10.71 ***	26.16 ± 22.43 **	27.6 ± 27.79 ***	19.88 ± 21.96	19.74 ± 21.23
	Yes	22.12 ± 16.11 ***	31.15 ± 22.97 **	40.86 ± 26.86 ***	21.89 ± 23.08	22.48 ± 22.16
Agile worki	*No*	21.26 ± 16.30 ***	30.13 ± 23.21 ***	35.96 ± 28.44 ***	22.13 ± 22.80 ***	22.23 ± 22.14 ***

ng	*Yes*	12.60 ± 12.26 ***	18.78 ± 18.04 ***	16.64 ± 20.94 ***	14.34 ± 19.30 ***	14.47 ± 17.94 ***

Note: PTSD, post-traumatic stress disorder. *** $p \leq .001$. ** $p \leq .01$ * $p \leq .05$.

Table 2b. ANOVA post hoc test (Bonferroni) for PIRI subscales by professional category.

Professional category		**Mean difference (CI 95%)**			
		Sleep problem subscale	**Energy recovery subscale**	**PTSD subscale**	**Chronic fatigue subscale**
Nurses	*vs physicians*	7.51 (1.18-13.83) *	3.12 (-4.42-10.67)	7.71 (1.40-14.01) **	-1.14 (-7.22-4.94)
	vs technicians	10.18 (3.99-16.37) ***	14.22 (6.83-21.62) ***	9.34 (3.16-15.52) ***	3.83 (-2.13-9.79)
	vs administrative personnel	17.48 (10.99-23.96) ***	27.97 (20.23-35.70) ***	13.44 (6.97-19.90) ***	12.09 (5.85-18.32) ***
Physicians	*vs nurses*	-7.51 (-13.83--1.18) *	-3.12 (-10.67-4.42)	-7.71 (-14.01--1.40) **	1.14 (-4.94-7.22)
	vs technicians	2.67 (-3.96-9.31)	11.10 (3.18-19.02) ***	1.63 (-4.99-8.25)	4.97 (-1.41-11.35)
	vs administrative personnel	9.97 (3.07-16.87) ***	24.84 (16.61-33.08) ***	5.73 (-1.15-12.62)	13.23 (6.59-19.87) ***
Technicians	*vs nurses*	-10.18 (-16.37--3.99) ***	-14.22 (-21.62--6.83) ***	-9.34 (-15.52--3.16) ***	-3.83 (-9.79-2.13)
	vs physicians	-2.67 (-9.31-3.96)	-11.10 (-19.02--3.18) ***	-1.63 (-8.25-4.99)	-4.97 (-11.35-1.41)

vs administrative personnel	7.30 (0.52-14.08) *	13.75 (5.65-21.84) ***	4.10 (-2.67-10.87)	8.26 (1.73-14.78) **

Note: PTSD, post-traumatic stress disorder. *** $P \leq .001$. ** $P \leq .01$ * $P \leq .05$.

The risk for psychological impairment (standardized scores ≥26 [25]) was found in 196 subjects (30.6%) (Table 3a). They were almost 45-yo-females (over 35%); no age difference was recorded between males and females at risk. Greater percentages were recorded for energy recovery and sleep problems subscales (48.0 and 44.7 % respectively). Up to over 69% of females reported a lack of energy recovery, while 38% of males resulted at risk; half of female workers reported PTSD as well as chronic fatigue (Table 3b).

Table 3a. PIRI scores of subjects at risk (scores ≥26).

		PIRI total score	**Sleep problems subscale**	**Energy recovery subscale**	**PTSD subscale**	**Chronic fatigue subscale**
Total		196 (30.6%)	284 (44.7)	305 (48.0)	212 (33.4)	212 (33.4)
Gender	*Female*	157 (80.1%)	222 (78.2)	230 (75.4)	168 (79.2)	161 (75.9)
	Male	39 (19.9%)	62 (21.8)	75 (24.6)	44 (20.8)	51 (24.1)
Age (mean ± SD)		45.41 ± 11.48	45.23 ± 13.04	45.04 ± 12.79	45.39 ± 11.77	45.08 ± 11.53
Seniority (mean ± SD)		17.52 ± 11.28	16.48 ± 11.56	15.98 ± 11.10	17.10 ± 11.39	16.51 ± 11.20
Professional categories	*Nurses*	90 (45.9%)	117 (41.2)	117 (38.4)	90 (42.5)	81 (38.2)
	Physicians	50 (25.5%)	71 (25)	94 (30.8)	47 (22.2)	61 (28.8)

	Technicians	36 (18.4%)	61 (21.5)	67 (22)	46 (21.7)	48 (22.6)
	Administrative personnel	20 (10.2%)	35 (12.3)	27 (8.9)	29 (13.7)	22 (10.4)
Commuting	*No*	183 (93.4%)	262 (92.3)	280 (91.8)	197 (92.9)	191 (90.1)
	Yes	13 (6.6%)	22 (7.7)	25 (8.2)	15 (7.1)	21 (9.9)
Agile working	*No*	178 (90.8%)	247 (87)	276 (90.5)	184 (86.8)	184 (86.8)
	Yes	18 (9.2%)	37 (13)	29 (9.5)	28 (13.2)	28 (13.2)

Note: PTSD, post-traumatic stress disorder

Table 3b. Gender difference for subjects at risk (score ≥26).

	PIRI total score	**Sleep problems subscale**	**Energy recovery subscale**	**PTSD subscale**	**Chronic fatigue subscale**
Total	196/635 (30.60%)	284/635 (44.70%)	305/635 (48.00%)	212/635 (33.40%)	212 (33.40%)
Female	157/438 (35.84%)	222/438 (50.68%)	305/438 (69.63%)	212/438 (48.40%)	212/438 (48.40)
Male	39/197 (19.80%)	62/197 (31.47%)	75/197 (38.07%)	44/197 (22.34%)	51/197 (25.89%)

Note: PTSD, post-traumatic stress disorder

Logistic regression analysis confirmed this trend resulting female workers having a two-fold risk for potential psychological impairment (Table 4).

Table 4. Logistic regression analysis of PIRI scores by demographic and occupational variables.

PIRI (total)							
Predictor		**Model I**			**Model II**		
		B	**S.E.**	**OR (95% C.I.)**	**B**	**S.E.**	**OR (95% C.I.)**
Gender *(females vs males)*		.72	.23	2.06 (1.31-3.23)**	.71	.23	2.04 (1.30-3.21)**
Professional category	*Nurses* †	1.36	.34	3.90 (1.99-7.62)**	1.16	.36	3.19 (1.60-6.36)**
	Physicians †	.91	.35	2.48 (1.25-4.94)**	.75	.36	2.12 (1.05-4.28)*
	Technicians †	.57	.34	1.77 (0.91-3.43)	.44	.34	1.55 (0.79-3.03)
Commuting *(non-commuters vs commuters)*		.46	.37	1.58 (0.77-3.25)	.32	.37	1.38 (0.67-2.87)
Night shifts *(no-night shifters vs night shifters)*		.14	.23	1.15 (0.73-1.79)	.27	.23	1.31 (0.83-2.07)
Age		.00	.01	1.00 (0.98-1.03)	.01	.01	1.01 (0.98-1.03)
Seniority		.03	.01	1.03 (1-1.05)	.02	.01	1.02 (0.99-1.05)
Agile working *(no vs yes)*		-	-	-	-.87	.34	2.38 (1.22-4.64)*
Constant		-3.05	.66	.05**	-2.80	.66	.03**
Sleep problem subscale							
Predictor		**Model I**			**Model II**		
		B	**S.E.**	**OR (95% C.I.)**	**B**	**S.E.**	**OR (95% C.I.)**
Gender *(females vs males)*		.84	.20	2.32 (1.55-3.47)**	.84	.21	2.32 (1.55-3.46)**

	Nurses †	1.20	.30	3.30 (1.81-6.02)**	1.15	.31	3.16 (1.71-5.85)**
Professional category	*Physicians †*	.78	.31	2.18 (1.19-4.00)*	.74	.31	2.11 (1.13-3.896)*
	Technicians †	.75	.29	2.12 (1.21-3.71)**	.72	.29	2.06 (1.17-3.633)*
Commuting *(non-commuters vs commuters)*		.35	.31	1.41 (0.77-2.60)	.32	.31	1.38 (0.75-2.54)
Night shifts *(no-night shifters vs night shifters)*		-.11	.22	0.89 (0.58-1.36)	-.08	.22	0.92 (0.60-1.43)
Age		.01	.01	1.01 (0.91-1.03)	.01	.01	1.01 (0.99-1.04)
Seniority		.01	.01	1.01 (1.00-1.04)	.01	.01	1.01 (0.99-1.04)
Agile working *(no vs yes)*		-	-	-	.17	.27	1.19 (0.70-2.02)
Constant		-2.50	.58	.08**	-2.63	.61	.07**

Energy recovery subscale

Predictor		**Model I**			**Model II**		
		B	**S.E.**	**OR (95% C.I.)**	**B**	**S.E.**	**OR (95% C.I.)**
Gender *(females vs males)*		.61	.21	1.84 (1.23-2.75)**	.61	.21	1.83 (1.22-2.76)**
Professional category	*Nurses †*	1.34	.32	3.80 (2.04-7.10)**	1.15	.33	3.16 (1.67-5.99)**
	Physicians †	1.57	.32	4.83 (2.56-9.10)**	1.44	.33	4.21 (2.21-8.04)**
	Technicians †	1.16	.30	3.20 (1.78-5.75)**	1.05	.31	2.87 (1.57-5.21)**
Commuting *(non-commuters vs commuters)*		.05	.31	1.05 (0.57-1.93)	-.07	.32	0.93 (0.50-1.73)

Night shifts *(no-night shifters vs night shifters)*	-.72	.22	0.49 (0.32-0.75)**	-.55	.23	0.57 (0.37-0.90)*
Age	.01	.01	1.01 (0.99-1.03)	.02	.01	1.02 (0.99-1.04)
Seniority	.02	.01	1.02 (1.00-1.04)	.01	.01	1.01 (0.99-1.04)
Agile working *(no vs yes)*	-	-	-	.87	.29	2.39 (1.36-4.21)**
Constant	-1.85	.58	.16**	-2.54	.64	.08**

PTSD subscale

Predictor		**Model I**			**Model II**		
		B	**S.E.**	**OR (95% C.I.)**	**B**	**S.E.**	**OR (95% C.I.)**
Gender *(females vs males)*		.74	.22	2.10 (1.36-3.23)**	.74	.22	2.10 (1.35-3.22)**
Professional category	*Nurses* †	.76	.32	2.13 (1.15-3.95)*	.65	.33	1.91 (1.01-3.61)*
	Physicians †	.16	.33	1.18 (0.62-2.24)*	.08	.34	1.08 (0.56-2.08)
	Technicians †	.38	.30	1.46 (0.81-2.64)	.31	.31	1.36 (0.75-2.49)
Commuting *(non-commuters vs commuters)*		.66	.35	1.93 (0.97-3.86)	.60	.36	1.82 (0.90-3.64)
Night shifts *(no-night shifters vs night shifters)*		-.01	.22	0.99 (0.64-1.54)	.61	.23	1.06 (0.68-1.67)
Age		.01	.01	1.01 (0.99-1.03)	.01	.01	1.01 (0.99-1.04)
Seniority		.02	.01	1.02 (0.99-1.04)	.01	.01	1.01 (0.99-1.04)
Agile working *(no vs yes)*		-	-	-	.41	.30	1.50 (0.84-2.69)

Constant	-2.96	.62	.05 **	-3.20	.64	.04**
Chronic fatigue subscale						
Predictor	**Model I**			**Model II**		
	B	**S.E.**	**OR (95% C.I.)**	**B**	**S.E.**	**OR (95% C.I.)**
Gender *(females vs males)*	.42	.21	1.52 (1.00-2.30)*	.42	.21	1.51 (1.00-2.30)*
Professional category *Nurses* †	1.23	.33	3.44 (1.79-6.59)**	1.18	.34	3.27 (1.68-6.36)**
Professional category *Physicians* †	1.28	.34	3.58 (1.85-6.93)**	1.24	.34	3.44 (1.76-6.72)**
Professional category *Technicians* †	.88	.32	2.40 (1.29-4.47)**	.84	.32	2.32 (1.24-4.36)**
Commuting *(non-commuters vs commuters)*	-.24	.31	0.78 (0.42-1.45)	-.27	.32	0.76 (0.41-1.42)
Night shifts *(no-night shifters vs night shifters)*	.21	.22	1.23 (0.80-1.89)	.24	.23	1.28 (0.82-1.98)
Age	-.01	.01	1.00 (0.98-1.02)	-.01	.01	1.00 (0.98-1.02)
Seniority	.02	.01	1.02 (1.00-1.05)	.02	.01	1.02 (1.00-1.05)
Agile working *(no vs yes)*	-	-	-	.20	.29	1.22 (0.69-2.14)
Constant	-2.03	.60	.13**	-2.18	.34	.11 **

Note: † *vs administrative personnel* *: $P \leq .05$; ** $P \leq .01$.

Considering PIRI total score, nurses presented a three-fold risk while physicians a two-fold risk for psychological impairment. Additionally, from the single subscale logistic regression technicians showed a significant double risk for sleep problems and chronic fatigue as well as a three-fold risk for decreased energy recovery. For the latter subscale physician reported the highest relative risk (over four-fold), and an important predictor was night shifts (no-night shifters have a half risk for reporting a lack of energy recovery). PTSD subscale registered a minor risk for nurses (two-fold) compared to the general reported trends. Finally, physicians reported also a three-fold risk for chronic fatigue as happened for nurses. Interestingly, agile working (inserted in the model II of the logistic regression analysis) was a two-fold protecting factor for PIRI, explained by the energy recovery subscale.

DISCUSSION

The current COVID-19 pandemic has strongly influenced everyone's daily life at different extent and in many different ways. This study highlights the psychological impact in a healthcare setting, where a psychological support desk is currently working [28]. Four aspects are noteworthy.

First, the studied sample exhibited gender differences in the perception of COVID-19-related occupational distress, being females more affected by the risk for developing a psychological injury than males. To date, conflicting data has been reported about gender influence on COVID-19 psychological impact [16]. Female gender is a predictor of burnout for HCWs [13], but no gender differences has been reported in the general population for psychological symptoms [11].

Second, a significant reduction of energy recovery has been recognized among HCWs, as well as sleep disturbances, both of which are a cause of great concern worldwide. According to the general population, a broad outbreak of sleep problems (affecting approximately 40% of people) has been registered [29].

Third, nurses experienced the highest psychological injury, followed by physicians and technicians. Previous evidence showed increasing negative psychological effects (e.g., stress-related mood disorders) among SARS-infected HCWs [30-32], likely explained by direct neuroinflammatory effects of SARS-CoV-2, which can alter the psychoneuroimmunity and predispose to stress disorders and other long-lasting neurological diseases [33, 34]. Moreover, the persistent fear of contagion has been pressuring the entire health care system, especially nursing care, which is, among hospital occupational activities, the closest to the users and thus the most exposed at frontline [35]. High levels of traumatic stress have been recognized among emergency nurses in their usual workplace due to a chronic cumulative trauma [36], and COVID-19 pandemic has reproduced an emergency scenario, generating additional distress.

Finally, agile working interestingly represented a protecting factor able to narrow COVID-19 psychological burden by improving energy recovery. This is likely due to self-management of working time, which is indeed a double-edged weapon considering on the one hand the proved reduction of work-related stress [37], and on the other hand the risk of intrusive leadership and overtime work [38]. However, more research is needed by employers to improve employees' working life in remote workstations [39].

All these points should encourage occupational physician's attention as crucial elements to consider for a real improvement of workers' health. At this regard, a psychological intervention

plan should be framed within the mandatory occupational health surveillance program, involving mental healthcare providers, too [40–42]. A comprehensive approach based on workplace health promotion (WHP) programs should be dynamically designed and monitored in the organization agenda, planning a tailored focus on HCWs' global demands to effectively manage COVID-related distress during and after the pandemic period (such as yoga and mindfulness and spiritual techniques [43-46]).

A possible limitation of the research concerns, instead, the choice of the sample, which included only hospital employees; as a future prospect, therefore, it is proposed to broaden the research to a wider population. Moreover, the cross-sectional design limits the statistical inference on the overall HCWs community.

CONCLUSION

In the context of COVID-19 pandemic, emerging problems can lead to further risks of damage to both physical and mental health. Actions are needed as part of the pandemic response to ease the psychological impact, improve coping skills and resilience of HCWs, in order to assure a safe and quality assistance [47]. Finally, in the next future, agile working approaches could be wider inserted in the healthcare system, involving assistance figures too, likely providing specific training and a proper turnover of personnel.

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