


Concerns, Perceived Impact, Preparedness in Coronavirus Disease (COVID-19) Pandemic and Health Outcomes among Italian Physicians: A Cross-Sectional Study

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Abstract

Background: Health care workers (HCWs) are among the professionals at serious risk for the impact of the COVID-19 pandemic on their mental health. In this sense, the next public health challenge globally will be to preserving healthy HCWs during this pandemic.

Aim: The present study has the aim of investigating the relationship among concerns, perceived impact, preparedness for the COVID-19 pandemic and the mental health of Italian physicians.

Methods: From March 29th to April 15th 2020, we conducted an online survey using snowball sampling techniques through Limesurvey platform. Data were analyzed using descriptive statistics and multiple binary logistic regressions.

Results: Multivariate analysis showed that the risk factors for perceived job stress were concerns about catching COVID-19 (OR=3.18 [95% CI=2.00-5.05] $P<.001$), perceived impact on job demands (OR=1.63 [95% CI=1.05-2.52] $P<.05$), perceived impact on job role (OR=2.50 [95% CI=1.60-3.90] $P<.001$), and non-working concerns (OR=1.86 [95% CI=1.15-3.03] $P<.05$). With respect to the risk factors for rumination about the pandemic emerged concerns about catching COVID-19 (OR 1.74, [95% CI=1.12-2.71] $P<.05$), perceived impact on job role (OR=1.68 [95% CI=1.12-2.52] $P<.05$), and impact on personal life (OR=2.04 [95% CI=1.08-3.86] $P<.05$). Finally, the risk factors for crying at work were perceived impact on job role (OR=2.47, [95% CI=1.20-5.09] $P<.05$), rumination about the pandemic (OR=3.027 [95% CI=1.27-7.19] $P<.01$), watching colleagues crying at work (OR=3.82 [95% CI=1.88-7.77] $P<.01$), and perceived job stress (OR=3.53 [95% CI=1.24-10.07] $P<.05$).

Conclusion: In general, our results highlighted that being concerned about being infected/infecting other people, carrying out new and unusual tasks, and witnessing colleagues crying at work were important risk factors for physicians' well-being. Additional data are necessary to advance understanding of these risk factors in a long-term perspective.

Keywords

concerns, perceived impact, preparedness, COVID-19, mental health, physicians

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Introduction

When the World Health Organization (WHO) declared the Coronavirus Disease (COVID-19) outbreak as a pandemic, many Countries realized that it was going to become a serious concern for both public and occupational health.¹ The WHO declared that “*this is not just a public health crisis, it is a crisis that will touch every sector*”.¹ Thus, the preparedness of national health care systems to the pandemic has

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become crucial in assessing risks, and then monitoring and limiting the spread of the virus. According to the WHO guidelines, as health care workers (HCWs) work extensively and closely in contact with infected individuals in healthcare settings, they are more exposed to hazards that put them at risk of infection.^{2,3} In fact, HCWs are among the 4 groups of people at serious risk for the impact of the COVID-19 pandemic on their mental health.^{4,5} In this sense, preserving healthy HCWs during the pandemic represents the most important public health challenge globally. For this reason, the WHO, the CDC, and the EU-OSHA provided detailed guidelines aimed at protecting HCWs.⁶⁻⁸ Despite these important guidelines, in many Countries this pandemic pushed and it is still pushing HCWs to work beyond their limits. Higher workload, higher risk of infection, lack of specific drugs, and insufficient supply of protective equipment represent the common scenario for HCWs in many countries.⁹ The European Centre for Disease Prevention and Control reported that the percentage of HCWs diagnosed with COVID-19 ranges from 9% to 26%.¹⁰ A meta-analysis reported that during the first 3 months of the pandemic, 10% of all COVID-19 patients were HCWs.³

Unadkat and Farquhar sustained that “the paradox [for health care systems] is that the more pressured things become, the more important it is to pay attention to the well-being of our staff”.¹¹ In fact, in the pandemic scenario, HCWs are at risk of long working hours, higher job demands, physical and psychological violence, stigma, fatigue, psychological distress, anxiety, and depression.^{4,12-14}

In previous researches on recent outbreaks,^{15,16} such as Severe Acute Respiratory Syndrome (SARS) and H1N1 flu virus, HCWs were found to be distressed, emotionally affected and traumatized. Additionally, HCWs showed fear of getting infected and fear of transmission to their loved ones and children.¹⁷ For example, Maunder and colleagues, analyzing the impact of SARS outbreak on HCWs’ well-being, showed that distress was found in more than a third of healthcare workers.¹⁸ The main sources of distress were: treating colleagues with SARS,¹⁹ fear of contagion,²⁰ concern for the health of their families.²¹ Two recent systematic reviews and meta-analyses on mental health problems in HCWs during and after infectious disease outbreaks, showed that HCWs reported frequently PTSD, anxiety, depression, insomnia, and burnout.^{22,23}

Lai and colleagues investigated the factors associated with mental health among healthcare workers treating patients with COVID-19 in China and found high prevalence of mental health symptoms such as: depression, anxiety, insomnia, and distress.⁹ Two studies conducted in Wuhan (China) during the first phase of the COVID-19 outbreak provided data on the mental health of medical workers.^{13,14} Both studies highlighted that HCWs showed fatigue, worries, frustration, isolation, depression, anxiety,

stress, insomnia, anger, and denial. Furthermore, as both the number of recovered patients and mortality rates increased, HCWs were exposed to patients’ suffering and deaths, taking an extra emotional and psychological toll on them.²⁴ These results are in line with other studies carried out in Europe, where HCWs showed high levels of psychological burden.^{25,26} Many studies have highlighted that HCWs manifested fatigue, worries, frustration, isolation, rumination, depression, anxiety, stress, post-traumatic stress, and insomnia.^{23,27}

Concerning the Italian context, the Italian National Institute of Health (ISS) reported more than 60242 infected HCWs, accounting for 5% of the total number of positive cases (n=1231367).²⁸ However, in the first 3 months of the pandemic this percentage was higher than 10%.²⁸ In March, the number of COVID-19 cases reported in Italy was 113,011 and 94,257 in April. On the 23rd of March, the Italian National Institute of Health (ISS) estimated 41.1% of positive subjects with mild symptoms, 21.1% with severe symptoms such as to require hospitalization 4.6% and requiring hospitalization in the Intensive Care Units. From the 20th of February to the 30th of April 2020, 28,561 deaths in people positive for COVID-19 were recorded: 15,114 (53%) died within the month of March and 13,447 (47%) within the month of April. At the end of the survey (15th April 2020). The ISS reported the rate of more than 15% (CI 14% - 16%) infected HCWs on the total cases diagnosed in Italy (7 days period).²⁸ The number of deaths among physicians has increased on a daily basis, reaching more than 200 cases.²⁹ According to the National Federation of Orders of Surgeons and Dentists (FNOMCeO), general practitioners (GPs) accounted for the highest number of HCWs’ deaths (n=57). It has been reported a slightly higher mortality due to COVID-19 in physicians and dentists (0.046%) than in the general population (0.039%).³⁰

Since the first case in Italy, national and international social media reported a plethora of “dramatic stories” of how medical staff was struggling to cope with the pandemic.³¹ Most of these stories highlighted both the emotional and psychological impact of this pandemic on physicians. Especially during the first phases of the outbreak, as Italian physicians were totally unaware of the presence of SARS-CoV-2-infected patients, they reported (1) very low knowledge of the risks, (2) inadequate preventive procedures to be applied and, (3) shortage of personal protective equipment (PPE).³²

Nevertheless, there are limited published scientific studies reporting data on Italian physicians’ concerns, perceived preparedness and perceived well-being during this COVID pandemic. For example, Di Tella, Romeo, Benfante, and Castelli found that HCWs working in COVID-19 units showed higher levels of depressive symptoms and post-traumatic symptoms than those who worked in other healthcare units.³³

Therefore, the main purpose of the current was aimed to (1) describe the levels of COVID-19 related concerns, perceived impact preparedness of a sample of Italian physicians, and to (2) explore their relationship with mental health effects, mainly job stress, rumination about the COVID-19, and crying at work. Specifically, was to assess. we expected that job stress, rumination about the COVID-19, and crying at work to be linked to lower organizational and personal preparedness, higher concerns about catching COVID-19, increased job demands, higher perceived impact on personal life.

Materials and Methods

Data Collection

A national self-reported online survey from March 29th to April 15th 2020 was implemented with Limesurvey and promoted by sharing the link of the survey on social networking platforms (Facebook, LinkedIn, and Twitter) in Italy. The survey's homepage reported the online informed consent form with specific information about the study purpose, the questionnaire general description, including information about risks and benefits of participating in the survey. To ensure anonymity, we did not register IP addresses neither did we request any other sensitive data. The eligibility criteria were (a) working as physicians in Italy, and (b) having been occupationally active since the launch of the survey. Participants did not receive any incentive to take part in the study. Information about demographics data including gender, age, geographic area of employment, marital status, children, presence/absence in the family of other medical doctors, job description, current activity as medical doctor (yes/no), years of practice, working in a COVID-19 center (yes/no), history of having had patients who died of COVID-19 (yes/no) were collected.

Measures

Following a translation-back-translation procedure,³⁴ we used the questionnaire previously developed for measuring concerns and preparedness during the 2003 severe acute respiratory syndrome (SARS) epidemic among HCWs.³⁵ Specifically, we adapted the questionnaire to assess the impact of the COVID-19 pandemic among Italian physicians. We considered the following factors: (1) Preparedness (organizational preparedness, 1 item, and Regional Health System [RHS] preparedness, 3 items; eg, "My hospital\ RHS has a preparedness plan for the COVID-19 pandemic"), (2) personal preparedness (3 items; eg, "I am personally prepared for the COVID-19 pandemic"); (3) concerns about catching COVID-19 (3 items; eg, "I am afraid of falling ill with COVID-19"); (4) perceived impact on personal job: increased job demands (3 items; eg, "I had

an increase in workload in my job") and job role (1 item: "I would had to do work not normally done by me"); (5) perceived impact on personal life (4 items; eg, "People avoid me because of my job"); (6) non-work-related concerns (10 items; eg, "People close to me are at high risk of getting COVID-19 because of my job"); (7) perceived job stress (1 item: "I feel more stressed at work"); (8) rumination about the pandemic (we used 2 items from the Rumination on Sadness Scale³⁶ but each item specifically referred to the pandemic; eg, "I have difficulty getting myself to stop thinking about this pandemic")(9) crying at work due the pandemic (2 items for measuring the frequency of crying at work due the pandemic and watching colleagues crying at work; eg, "I have been crying at work because I felt like I could not take it anymore").

All items were answered on a 5-point Likert scale from 1 (strongly disagree) to 5 (strongly agree).

Cronbach's alpha coefficients were as follows: 0.76 for RHS preparedness, 0.80 for personal preparedness, 0.71 for concerns about catching COVID-19, 0.70 for increased job demands, 0.77 for perceived impact on personal life, and 0.75 for non-work-related concerns.

We examined the distinctiveness of the measurement model by performing a Confirmatory Factor Analyses (CFA) with MPlus 7,³⁷ using the weighted least squares mean and variance adjusted estimator. In considering the model fit, we relied on the following goodness-of-fit indices:

robust Satorra–Bentler scaled test χ^2 , the Comparative Fit Index (CFI), the Tucker-Lewis Index (TLI) and the root mean square error of approximation (RMSEA). We considered values >0.90 and 0.95 for the CFI and TLI, respectively, indicating adequate and excellent fit to the data, whereas values smaller than 0.08 or 0.06 for the RMSEA as acceptable and excellent model fit.^{38–40}

Data Analysis

Data analysis was performed using SPSS statistical software version 26.0 (IBM Corp). The significance level was set at $\alpha = .05$, and all tests were 2-tailed. Frequencies, percentages, mean and standard deviation values were calculated. After testing for normality by using both the Kolmogorov-Smirnov and Shapiro-Wilk tests, we found that our data violated the normality assumption for data distribution. Mann–Whitney U test and Kruskal–Wallis test were used.

The demographic characteristics and information about the work history of the study population were investigated by dividing subjects into 4 groups on the basis of presence/absence of working activity in a COVID-19 center and presence/absence of patients who died of COVID-19.

The Mann–Whitney U test, the Pearson's chi-squared test or the Fisher-Freeman-Halton Test, were used to evaluate the differences between the 4 groups (presence/absence

of working activity in a COVID-19 center - presence/absence of patients who died of COVID-19 relating to gender, age, age group (20-29, 30-39, 40-49, 50-59, 60-69, 70-79 years), geographic area of employment (Islands and south Italy, central Italy, northern Italy), marital status (single, married, divorced/separated, widowed, other), children (yes/no), presence/absence in the family of other medical doctors (partner or children), job description (specialist registrar, consultant, general practitioner including trainers and family pediatrician, doctor on call, others including dentists), current activity as medical doctor (yes/no), years of practice.

To investigate potential risk factors on health outcomes (perceived stress, crying at work and rumination) among physicians, binary logistic regression analyses were performed. The associations between risk factors and outcomes were presented as odds ratios (ORs) and their 95% CIs. Estimates were adjusted for gender, age, working in a COVID center (yes/no), geographical location (north, central and south Italy), and history of having had patients who died of COVID-19 (yes/no).

Furthermore, we divided our participants into: low-stress and high-stress respondents, low/ high rumination, crying/not crying at work. We considered the central point (=3) of the rating scale as the cut off criteria.

Results

A total of 521 Italian physicians completed the survey. Of the participants, 300 (58%) were women aged 50 to 59 years (123 [24%]), 306 (58%) worked in Islands and south Italy, 282 (54%) were married, 285 (55%) had children, and 195 (37%) worked in a COVID center.

Table 1 shows demographic and job characteristics of the study population. Significant differences were found between the groups of physicians working or not in a COVID-19 center: about geographic area of employment, the majority of the physicians who responded to the survey worked in Islands and south Italy and were not involved in activities in a COVID-19 centre ($P < .001$); the percentages of general practitioners and doctors on call were higher between those not working in a COVID-19 centre (12.3% vs 3.3% and 5.2% vs 0.0%, respectively) ($P < .001$); there were not retired physician active as medical doctor in COVID-19 centre ($P = .003$). Among physicians with or without history of having had patients who died of COVID-19, significant differences were found for age (median 44.5 IQR 35.2-56.7 vs 50.0-IQR 37.0, 60.0) ($P = .045$) and geographic area of employment (48.6% worked in Islands and south Italy and had not history of having had patients who died of COVID-19 - $P < .001$).

In the previous 6 months, 19% of the sample attended infection control training sessions, 11% participated in infection control audits, 25% bought personal protective

equipment (PPE), 27.6% had patients who died of COVID-19.

Confirmatory Factor Analysis

The results for CFA revealed that the hypothesized eight-factor model fitted the data: $\chi^2 = 747.00$ $df = 296$, $P < .001$, RMSEA = .054, CFI = .90, TLI = .88. The inspection of modification indices and standardized residuals suggested model fit improvement if correlated errors were estimated. Thus, this final measurement model was refitted allowing for error correlation between 3 couple of errors. Fit indices indicated improved fit: $\chi^2 = 670.46$ $df = 293$, $P < .001$, RMSEA = .050, CFI = .92, TLI = .90. This last model fitted the data significantly better than the one-factor model ($\chi^2 = 2457.95$, $df = 298$, $P < .001$, RMSEA = .118, CFI = .48, TLI = .43), providing evidence for the convergent and discriminant validity of the measurement model.

Preparedness, Concerns, and Perceived Impact of the COVID-19 Pandemic

Analyzing all preparedness measures, 82.1% of the physicians felt that their organization was not prepared for COVID-19 pandemic, and 86.9% of the sample felt that their RHS was not prepared for the COVID-19 pandemic. Furthermore, 7.7% of the sample declared that their RHS had informed physicians about the pandemic management plan. Finally, 12.3% claimed that their RHS had rapidly coped with the pandemic. In regard to personal preparedness, 11.9% felt personally prepared for the pandemic, 12.0% had received adequate COVID-19 trainings, 19% had received adequate PPE training, and 18.3% had someone to turn to if they were unsure about the usage of PPE.

Regarding concerns about catching COVID-19, 69.5% of the physicians agreed that their job had put them at high risk and 52.4% were concerned of getting infected.

Concerning the perceived impact on personal job, 44.3% experienced increase in demands, and 40.9% had to perform tasks that they were not used to do.

In regard to perceived impact on personal life, 26.7% was afraid of telling their family about the risk they were exposed to, 18.6% reported people avoided them because of their job, 8.4% reported that people avoided their family members because of their job, and 7.1% avoided telling other people about the nature of their job.

Regarding non-work-related concerns, 61.3% of the participants believed that people close to them would be at high risk because of their job, 47.4% ($n = 418$) were extremely concerned for their partners, 64.9% ($n = 382$) were extremely concerned for their parents, 68.2% ($n = 281$) were extremely concerned for their elderly relatives, 47.4% ($n = 274$) were extremely concerned for their child/children, 21.1% were extremely concerned for their close friends,

Table 1. Demographic Data and Characteristics of Overall Study Population and by Groups (Subjects Working or Not Working in a COVID-19 Centre and Subjects With or Without History of Having Had Patients Who Dead of COVID-19) and Presence or Absence of Significant Differences Between Groups.

	Study population n=521	Work in a COVID-19 centre		P value	History of having had patients who dead of COVID-19		P value
		Yes n=195 (37.4%)	No n=326 (62.6%)		Yes n=144 (27.6%)	No n=377 (72.4%)	
Gender							
Female n (%)	300 (57.6)	120 (23.0)	180 (34.6)	.17 ^a	77 (14.8)	223 (42.8)	.28 ^a
Male n (%)	221 (42.4)	75 (14.4)	146 (28.0)		67 (12.9)	154 (29.5)	
Age (median - IQR)	48.0-36.5, 59.0	48.0-37.0, 58.0	49.0-36.0, 60.0	.48 ^b	44.5-35.2, 56.7	50.0-37.0, 60.0	.045 ^b
Age group							
20-29 n (%)	28 (5.4)	12 (2.3)	16 (3.1)	.39 ^a	8 (1.5)	20 (3.8)	.50 ^a
30-39 n (%)	138 (26.5)	49 (9.4)	89 (17.1)		43 (8.3)	95 (18.2)	
40-49 n (%)	107 (20.5)	43 (8.3)	64 (12.3)		34 (6.5)	73 (14.0)	
50-59 n (%)	123 (23.6)	53 (10.2)	70 (13.4)		32 (6.1)	91 (17.5)	
60-69 n (%)	118 (22.6)	36 (6.9)	82 (15.7)		26 (5.0)	92 (17.7)	
70-79 n (%)	7 (1.3)	2 (0.4)	5 (0.9)		1 (0.2)	6 (1.2)	
Geographical area							
Islands and south Italy n (%)	306 (58.7)	89 (17.1)	217 (41.6)	<.001 ^a	53 (10.2)	253 (48.6)	<.001 ^a
Central Italy n (%)	72 (13.8)	31 (5.9)	41 (7.9)		20 (3.8)	52 (10.0)	
Northern Italy n (%)	143 (27.5)	75 (14.4)	68 (13.1)		71 (13.6)	72 (13.8)	
Marital status							
Single n (%)	166 (31.8)	59 (11.3)	107 (20.5)	.72 ^c	48 (9.2)	118 (22.7)	.50 ^c
Married n (%)	282 (54.1)	105 (20.1)	177 (34.0)		71 (13.6)	211 (40.5)	
Divorced/separate n (%)	33 (6.4)	16 (3.1)	17 (3.3)		12 (2.3)	21 (4.0)	
Widowed n (%)	5 (1.0)	2 (0.4)	3 (0.6)		1 (0.2)	4 (0.8)	
Other n (%)	35 (6.7)	13 (2.5)	22 (4.2)		12 (2.3)	23 (4.4)	
Partner job description							
No partner n (%)	204 (39.2)	77 (14.8)	127 (24.4)	.83 ^a	61 (11.7)	143 (27.4)	.63 ^a
Medical n (%)	97 (16.7)	40 (5.8)	57 (10.9)		22 (4.2)	65 (12.5)	
Not medical n (%)	230 (44.1)	88 (16.9)	142 (27.2)		61 (11.7)	169 (32.5)	
Children							
Yes n (%)	285 (54.7)	111 (21.3)	174 (33.4)	.47 ^a	71 (13.6)	214 (41.1)	.14 ^a
No n (%)	236 (45.3)	84 (16.1)	152 (29.2)		73 (14.0)	163 (31.3)	
Children job description							
No children n (%)	236 (45.3)	84 (16.1)	152 (29.2)	.42 ^a	73 (14.0)	163 (31.3)	.28 ^a
Medical n (%)	33 (6.3)	10 (1.9)	23 (4.4)		7 (1.3)	26 (5.0)	
Not medical n (%)	252 (48.4)	101 (19.4)	151 (29.0)		64 (12.3)	188 (36.1)	
Job description							
Specialist registrar n (%)	44 (8.4)	22 (4.2)	22 (4.2)	<.001 ^a	14 (2.7)	30 (5.8)	.20 ^a
Consultant n (%)	308 (59.1)	141 (27.1)	167 (32.0)		93 (17.9)	215 (41.3)	
General practitioner (including trainers)/family pediatrician n (%)	81 (15.6)	17 (3.3)	64 (12.3)		19 (3.6)	62 (11.9)	
Doctor on call n (%)	27 (5.2)	0 (0.0)	27 (5.2)		8 (1.5)	19 (3.6)	
Other (including dentists) n (%)	61 (11.7)	15 (2.9)	46 (8.8)		10 (1.9)	51 (9.8)	
In activity							
Yes n (%)	505 (96.4)	195 (33.4)	310 (63.3)	.003 ^a	141 (27.1)	364 (69.8)	.57 ^c
No n (%)	16 (3.3)	0 (0.0)	16 (3.3)		3 (0.6)	13 (2.5)	
Years of activity (median - IQR)	20.0-10.0, 32.0	20.0-11.0, 29.0	20.0-9.0, 32.0	.95 ^b	19.0-10.0, 31.0	21.0-10.0, 32.0	.35 ^b

Abbreviations: IQR, interquartile range.

^aPearson's chi-squared test.^bMann-Whitney U test.^cFisher-Freeman-Halton Test.

31.1% were extremely concerned for their colleagues, and 43.8% of them were extremely concerned for their patients.

Finally, 58.2% claimed that the stress perceived at work mainly stems from the pandemic, 32.2% showed low

rumination about the latter, 11.6% cried at work, and 19.2% watched colleagues crying at work.

Relationships between Health Outcomes and Concerns

The results of the binary logistic regression analysis are reported in Table 2.

After having controlling for age, sex, working in a COVID-19 center, geographical location, and having patients who died of COVID-19, we performed 3 different binary logistic regressions. In the first one, results showed that perceived job stress was significantly associated with concerns about catching COVID-19 (OR=3.18 [95% CI=2.00-5.05] $P<0.001$), perceived impact on job demands (OR=1.63 [95% CI=1.05-2.52] $P<0.05$), perceived impact on job role (OR=2.50 [95% CI=1.60-3.90] $P<0.001$), and non-working concerns (OR=1.86 [95% CI=1.15-3.03] $P<0.05$). No significant associations were found with hospital preparedness, preparedness of the RHS, personal preparedness, and perceived impact on personal life.

The second one, regarding rumination about the pandemic, was significantly associated with concerns about catching COVID-19 (OR=1.74 [95% CI=1.12-2.71] $P<0.01$), perceived impact on job role (OR=1.68 [95% CI=1.12-2.52] $P<0.05$), and impact on personal life (OR=2.04 [95% CI=1.08-3.86] $P<0.05$). No significant associations were found with hospital preparedness, preparedness of the RHS, personal preparedness, concerns about catching the COVID-19, perceived impact on job demands, perceived impact on personal life, and non-working concerns.

Finally, results showed that crying at work was significantly associated with perceived impact on job role (OR=2.47, [95% CI=1.20-5.09] $P<0.05$), rumination about the pandemic (OR=3.037 [95% CI=1.27-7.19] $P<0.01$), watching colleagues crying at work (OR=3.82 [95% CI=1.88-7.77] $P<0.01$), and perceived job stress (OR=3.53 [95% CI=1.24-10.07] $P<0.05$). No significant associations were found with hospital preparedness, preparedness of the RHS, personal preparedness, perceived impact on job demands, and non-working concerns.

Discussion

There is an urgent need to understand the short- and long-term impact of this pandemic on the mental health of healthcare workers. Greenberg, Docherty, Gnanapragasam, and Wessely suggested that hospital managers should take significant measures to protect the mental health of healthcare staff.⁴¹ To the best of our knowledge, this study was one of the first to assess the relationship between concerns, perceived impact, preparedness for the COVID-19 pandemic

and health related outcomes among physicians in Italy. In general, our findings are in line with researches concerning previous and actual pandemic. With regard to preparedness for the COVID-19 pandemic, the vast majority of the sample reported that both their organization and RHS were not prepared for COVID-19 pandemic. Despite the decentralization of the Italian health system, with the organizational and administrative powers managed by Regions (and probable consequent differences between national geographical areas). Almost 90% reported that their RHS was not able to rapidly cope with the latter. Our results are in line with previous researches carried out during past pandemics, wherein 60% of HCWs reported that their Country was not sufficiently prepared.⁴² Tagashira, Takamatsu, Hasegawa, Uenoyama and Honda in their study on preparedness against COVID-19 in Japan, reported that hospital preparedness in the early phase of the pandemic was linked with nosocomial transmission in healthcare personnel.⁴³

With respect to personal preparedness, almost 90% of the sample did not feel professionally prepared for this pandemic. Additionally, more than 80% of the respondents considered inadequate the training concerning COVID-19 and the use of PPE. Training and PPE play an important role in fostering a perception of safety at work. In fact, a systemic literature review showed how training and the provision of PPE are 2 of the most important factors associated with HCWs preparedness to work during pandemic outbreaks.^{44,45} In regard to concerns, half of the sample reported to be extremely worried about being infected with COVID-19. Previous researches highlighted that concerns about being infected were an important factor associated with the unavailability of HCWs to work during an epidemic.⁴⁴ Our results are in line with recent works published among HCWs reporting that more than 50% was concerned about being infected.^{46,47} Furthermore, in their rapid systematic review, Muller and colleagues reported that worries about being infected were among the most common factors associated to increased risk of mental health problems among HCWs.⁴⁸

Notwithstanding, the availability of a vaccine would significantly reduce this concern.⁴⁸ Until a vaccine is found, the provision of PPE remains crucial in increasing perceived safety and reducing worries about being infected.⁴⁸

With regard to the impact on personal job, almost half experienced changes in their job in terms of job demands and job duties. Our findings are in line with previous researches, confirming that pandemics expose HCWs to a significant increase in workload.^{35,49}

Concerning the impact of this pandemic on personal life, less than 10% reported "social ostracism" for both themselves and their family. Our results are not in line with previous researches where more than 60% of HCWs experienced ostracism during the (SARS) epidemic.^{35,50} A possible explanation could be that our data has been collected in the

Table 2. Binary Logistic Regression Analyses for Health Outcomes and Relation with Concerns about the Pandemic (Odds Ratios and 95% Confidence Intervals for Significant Associations are Reported).

Dependent variable: Perceived job stress	OR	[95% CI]	
Gender	0.50**	0.32	0.76
Age group	0.88	0.75	1.03
Geographical location	0.93	0.73	1.20
Covid centre	0.76	0.47	1.22
Patients dead of COVID-19	2.09**	1.22	3.58
Hospital preparedness	1.63	0.58	4.62
Preparedness of the RHS	1.58	0.61	4.08
Personal preparedness	0.99	0.57	1.72
Concerns about catching the COVID-19	3.18***	2.00	5.05
Perceived impact on job demands	1.63*	1.05	2.52
Perceived impact on job role	2.50***	1.60	3.90
Perceived impact on personal life	1.66	0.82	3.36
Non working concerns	1.86*	1.15	3.03
Dependent variable: Rumination about the pandemic	OR	[95% CI]	
Gender	0.68	0.46	1.01
Age group	0.91	0.78	1.05
Geographical location	1.23	0.98	1.55
Covid centre	0.79	0.51	1.23
Patients dead of COVID-19	1.58	0.96	2.62
Hospital preparedness	0.96	0.36	2.57
Preparedness of the RHS	0.58	0.24	1.36
Personal preparedness	1.04	0.63	1.72
Concerns about catching the COVID-19	1.74*	1.12	2.70
Perceived impact on job demands	1.07	0.71	1.61
Perceived impact on job role	1.68*	1.12	2.52
Perceived impact on personal life	2.04*	1.08	3.86
Non working concerns	1.47	0.93	2.32
Watching colleagues crying at work	1.41	0.83	2.40
Dependent variable: Crying at work due the pandemic	OR	[95% CI]	
Gender	0.47*	0.23	0.99
Age group	0.72*	0.54	0.96
Geographical location	1.72**	1.18	2.50
Covid centre	0.71	0.33	1.56
Patients dead of COVID-19	1.66	0.73	3.74
Hospital preparedness	0.67	0.09	6.08
Preparedness of the RHS	2.11	0.63	7.10
Personal preparedness	1.25	0.50	3.10
Concerns about catching the COVID-19	1.02	0.42	2.49
Perceived impact on job demands	1.89	0.89	4.00
Perceived impact on job role	2.47*	1.20	5.09
Perceived impact on personal life	1.36	0.59	3.11
Non working concerns	0.91	0.35	2.37
Rumination about the pandemic	3.02*	1.27	7.19
Watching colleagues crying at work	3.82***	1.88	7.77
Perceived job stress	3.53*	1.24	10.07

Abbreviations: OR, odd ratios; CI, 95% confidence intervals; Variables were regrouped into 2 level status (low vs high).

* $P < .05$. ** $P < .01$. *** $P < .001$.

early phase of the first wave of the pandemic, when HCWs were considered as heroes. In this sense, Cabrini, Grasselli, and Cecconi reported data collected from the “COVID-19 Lombardy ICU-Network” in May 2020. Lombardy was the epicenter of the first COVID-19 in Italy and 25% of HCWs reported episodes of discrimination.⁵⁰ As the world is dealing with the second wave of the COVID-19 pandemic, more studies are necessary for understating and limiting the widespread stigmatization, mainly fear and avoidance of HCWs.

In regard to non-work-related concerns, in general, more than 60% of the sample was afraid of infecting their family, friends and patients. Our results are in line with the previous research on the SARS outbreak of 2003.¹⁶ In this sense, the quarantine of HCWs who work with COVID-19 patients is indispensable to assure a sense of safety for both the physician and his/her family.

Concerning health outcomes, the results showed that the main stress source perceived in the workplace by almost 60% of physicians was strictly related to this pandemic. Our results are in line with researches on factors associated to mental health in HCWs exposed to COVID-19 and confirmed the previous research that investigated the psychological reactions caused by the SARS outbreak of 2003.^{9,20,24,52–55} Almost 70% of the sample reported rumination about the pandemic. There are no available data that consider this outcome among HCWs. In a sample of bank cooperation, Bakker and van Wingerden²⁷ found that rumination about the pandemic was negatively related to employee well-being, mainly depressive symptoms and emotional exhaustion. In line with Bakker and van Wingerden,²⁷ we referred to rumination as a cognitive activity that passively focused physicians’ attention on the pandemic. In this sense, ruminating may represent an important factor in worsening emotional processing and influencing physicians’ general health.⁵⁵ Finally, we considered an underestimated reaction to emotional distress: the act of crying at work due the difficulty to deal with the pandemic-related workplace context. Almost 10% of our sample reported to have cried at work, and less than 20% witnessed colleagues crying at work. Crying at work is considered as a manifestation of the impossibility to accomplish emotional labor.⁵⁶ In this sense, crying is an important symptom of emotional distress that should be considered.

Finally, the results of the binary logistic regression analysis identified concerns about catching COVID-19, non-work-related concerns, increased job demands, and impact on job role as the main risk factors for job stress, after adjustments for age, sex, working in a COVID center, and having patients who died of COVID-19. In general, previous researches showed that HCWs tend to be exposed to significant stress during infectious epidemics.^{16,45} In line with these studies, we found confirmation that both being worried about being infected and infecting people close to

them are important stressors.^{48,57–59} In this sense, hospitals and department managers should plan interventions aimed at reducing these concerns by providing, for instance, a place where HCWs could temporarily isolate themselves from their families.⁶⁰ Furthermore, among the concerns related to the impact on personal job, increased job demands and impact on job role were identified as significant predictors of job stress. Our results are in line with the previous studies that highlighted how pandemics tend to increase HCWs workload—for instance—by having to deal with a higher number of patients, by performing new and unusual tasks and, finally, by working long hours.^{16,35,61} According to the job demand-control model of stress,⁶² excessive workload is a key risk factor for employees’ well-being. In this sense, this information should be considered in order to limit the impact of high workload periods by increasing the number of staff members and by building a supportive workplace.⁶³ However, an important source of demands is associated with emotional demands. For example, high exposure to patients’ death, patients’ suffering, and witnessing extreme physical pain in patients may result in emotional clashes, such as secondary traumatic stress.^{64,65} Then, we considered ruminations about the pandemic and crying at work as HCWS health outcomes. Regarding rumination about the pandemic, we found that concerns about perceived impact on personal life were the main risk factor. This is in line with previous researches carried out on “social ostracism” perceived by HCWs during pandemics.^{35,50,51} Specifically, rumination is associated with a number of stress-related disorders and requires an ability to “cognitively switch off”.⁶⁶ In this sense, to reduce ruminative thoughts about the pandemic, distraction techniques such as coping strategies may help HCWs to lessen job stress and recover after work.⁶⁵ Finally, we found that crying at work was strongly associated with job stress, rumination, and watching colleagues crying at work. Crying at work is more frequent when job stress is too high and physicians feel overwhelmed by excessive demands and emotional pressure.⁶⁷ Furthermore, as an expression of emotional contagion, working in a psychosocial environment where other colleagues cry may exacerbate this emotion among “susceptible” physicians. In this sense, it would be crucial for health organizations to foster actions aimed at reducing the level of stress at work and offering psychological support for those not adequately trained in emotional regulation.

Our study has important implications for understanding and promoting actions aimed at reducing the impact of this pandemic context on mental health of Italian physicians. According to a recent metanalysis, healthcare organizations should provide rapid support to their staff implementing early interventions. Our results highlighted that a closer attention is necessary in both communication policies and support systems of healthcare workers at both micro (working unit) and macro level (hospital). In this sense, in order

to increase perceived preparedness to pandemics, it is fundamental for healthcare executives and managers to provide personal protective equipment and training their staff in the proper use of them. Furthermore, Galbraith and colleagues suggested that there are different organizational programs aimed at supporting and protecting mental health of workers in pandemic scenarios.⁶⁸ Many of those programs were developed for pandemics and disaster management. For example, the Trauma Risk Management programme (TRiM) and the Mental Health First Aid (MHFA) showed their efficacy in providing short-term support for workers and reducing psychological distress risk.⁶⁸

This study has some limitations. Firstly, the design was cross-sectional and did not allow causal inferences. Future studies should consider a longitudinal design. Secondly, as we adopted a (virtual) snowball sampling method, selection bias could be an important confounder. Future studies should adopt a population-based sample of physicians. Third, since the first pandemic wave has mostly interested the north Italy, many doctors of those areas may have not had the opportunity to respond to our survey because they were engaged in dealing with the emergency: significant differences about geographic area of employment were found between the groups of physicians working or not in a COVID-19 center and among those with or without history of having had patients who died of COVID-19. Fourth, to reduce the time needed to complete the survey (10 minutes), we measured some variables by using single items. This choice is questioned as multiple-item scales tend to be more reliable and ensure content validity. However, it is generally agreed that single-item measures provide an acceptable balance between practical needs and psychometric concerns. Furthermore, single-item measures are very common in occupational health and there is general agreement that they are valid and reliable.⁶⁹ Future research should consider the use of reliable multi-item measures. Lastly, we adapted a previously questionnaire developed for the SARS epidemic. In the early phase of this pandemic, there was not the time for developing and validating new measures and then we opted for a valid and reliable questionnaire. However, in the last months, new measures were developed and future research should consider to investigate the validity of these ones.

Conclusion

Short- and long-term psychological effects of this pandemic on the mental health of physicians represent the new challenge that public health is bound to face in the next months. More data are necessary to gain a deeper understanding of the risk factors, as well as the development and the implementation of intervention measures aimed at supporting and promoting mental health among HCWs.⁵⁴

Author Contributions

IP, FM: literature search, conceptualization and study design, development of the questionnaire, data collection, analysis, data interpretation, manuscript writing. MG, IPir: literature search, development of the questionnaire, data interpretation, manuscript writing. ED, GF, MC: conceptualization and study design, data interpretation. All authors have seen and approved the final version of the manuscript for submission.

Declaration of Conflicting Interests

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Ethical Statement

This study is in accordance with the ethical standards of the institutional research committee at the University of Cagliari, with the Declaration of Helsinki in 1995 (as revised in Edinburgh 2000), and with the General Data Protection Regulation (EU) 2016/679 (GDPR) and the Italian privacy law (Decree No. 196/2003). We consulted the Institutional Review Boards of the University of Cagliari, which gave approval.

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