



# Burnout among healthcare professionals during COVID-19 pandemic: a cross-sectional study

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## Abstract

**Purpose** To describe the prevalence of burnout among healthcare professionals dealing with COVID-19 patients and the associated factors.

**Methods** In this cross-sectional survey, healthcare workers at six university-affiliated hospitals, who had been taking care of COVID-19 patients were studied. Age, gender, marital status, having children, hospital, job category, experience, and work load, as well as the level of burnout in each subscale were measured.

**Results** 326 persons (53.0%) experienced high levels of burnout. The average score in emotional exhaustion, depersonalization and lack of personal accomplishment was 26.6, 10.2, and 27.3, respectively. The level of burnout in the three subscales varied based on the personal as well as work-related factors and gender was the only variable that was associated with high levels of all three domains.

**Conclusions** Burnout is prevalent among healthcare workers caring for COVID-19 patients. Age, gender, job category, and site of practice contribute to the level of burnout that the staff experience.

**Keywords** Covid-19 · Burnout · Emotional exhaustion · Pandemic

## Introduction

Since December 2019, COVID-19 has rapidly spread worldwide, affecting people in 210 countries and territories with the current tally exceeding 53 million infected people and more than 1,300,000 deaths (Jin et al. 2020; World Health Organization 2019). In addition to the lives it has claimed

globally, the pandemic has led to high levels of panic and anxiety throughout the world (Chong et al. 2004; Sim and Chua 2004; World Health Organization 2003; SARS 2006). The first case of COVID-19 in Iran was reported on 18 February 2020, and at the time of this study, the national death toll exceeded 10,000, the ninth highest national death toll in the world (World Health Organization 2020a). By now, the cumulative number of cases has reached an alarming number of nearly 750,000 (World Health organization 2020b). Healthcare providers (HCP) are key players in the management of the pandemic COVID-19, and are inevitably in the front line of exposure to the virus (Draper et al. 2008). Therefore, they comprise a notable proportion of the people who have contracted the illness, with 10% of confirmed cases in some reports (In Memoriam 2020). A recent report from Iran mentioned that around 10,000 healthcare professionals have contracted COVID-19 and at least 43 are known to have died of this disease (Ing et al. 2020). This high rate of infection and mortality has a tremendous impact on the healthcare system.

Burnout, first described by Maslach et al. (1996), is a state of psychological, emotional, and physical stress in response to prolonged exposure to occupational stress. It includes

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feelings of emotional exhaustion (depletion of emotional resources), depersonalization (developing cynical attitudes about patients), and reduced professional accomplishment (a sense of negative evaluation of oneself).

The deadly and uncontrollable nature of COVID-19 together with relatively high rate of infection and mortality among HCPs can provoke the feelings of anxiety and stress in medical staff. Issues such as social stigmatization, shortage of personal protection equipment supplies, and heavy workload on the staff can aggravate this situation. Therefore, this pandemic is expected to have substantial psychological impact on HCPs (Guo et al. 2020).

Burnout can have serious consequences for both patients and the healthcare professionals. It not only results in poor physical and mental health outcomes, lack of motivation, absenteeism, and low morale in the staff, but also leads to deterioration of the quality of care provided by the affected staff with resulting poor outcomes for patients. Several systematic reviews have found that high levels of burnout in health care professionals are associated with less-safe patient care (Dewa et al. 2017; Hall et al. 2016). These consequences impose immense costs on the society (Dewa et al. 2014; Shanafelt et al. 2016).

Health authorities need more information on the magnitude of this problem and its associated factors to better prepare for future infectious disease outbreaks, and also to adapt sound interventions and implement strategies to alleviate the concerns and fears of HCPs and prevent further deepening of this dreadful situation (Draper et al. 2008).

This study was conducted on healthcare workers providing care for COVID-19 patients and aimed to explore the level of burnout among this population and also to examine factors associated with the development of this psychological sequel.

## Methods

This cross-sectional study was conducted during the current COVID-19 pandemic to evaluate the level of burnout among HCPs who were taking care of covid-19 patients at six university-affiliated hospitals. Altogether, these hospitals cover about one-third of Tehran province with a catchment area of about 4,000,000. The study was conducted about 2 months after the onset of the outbreak and when the disease had not yet been controlled.

Study participants included all HCPs (i.e., physicians, residents, interns, and nurses) who had taken care of COVID-19 patients at any time during the first 2 months of the outbreak. Exclusion criteria were those with no patient contact during the outbreak or those unwilling to participate.

The Institutional Review Board granted approval and the requirement for written informed consent was waived based

on the recognition that answering the survey instrument implied consent. Participation was voluntary and anonymity was assured. All personal information was kept confidential. Furthermore, researchers analyzed only de-identified data.

The data collection instrument comprised of two parts: The first part of the tool asked questions pertaining sociodemographic and work-related characteristics. The choice of variables was informed by the available literature and inputs from the investigators. Participants were requested to indicate their age, gender, marital status, number of children, job title, place of work, and years of experience. This section also asked whether the respondent had been involved in the care of COVID-19 patients and if yes for how many shifts a month and how many hours per shift. The second part of the study tool was a translated version of Maslach burnout inventory (MBI) for human services survey. To limit the study to burnout related to COVID-19, the phrase “due to COVID-19” was added to each item. MBI is an internationally recognized, validated, self-report questionnaire for measuring the severity of workplace burnout (Maslach and Jackson 1981), using the three dimensions of emotional exhaustion, depersonalization, and personal accomplishment. The questionnaire has 22 items and each item is answered on a five-point Likert scale. This tool has been extensively used in many studies in different parts of the world and the Persian translation has also been validated previously (Moalemi et al. 2018).

The study used a convenience sampling method for recruitment. Invitation to participate in the study was made through professional as well as informal networks. The message included an invitation explaining the purpose of the study, the name and contact details of the principal investigator, and a live link to the host survey platform (E Poll). The online self-administered questionnaire instructed participants to respond to the statements in the tool in relation to the COVID-19 outbreak. Verbal reminders through face-to-face contact and phone calls were performed on a weekly basis by a site coordinator at each hospital.

Burnout is expressed by scores of each of the three MBI subscales, with a high score meaning a high level of burnout. Each subscale score is calculated by adding up all scores of all items in that subscale, with the notion that the items on personal accomplishment domain are reversely scored (Maslach et al. 1996; Maslach and Jackson 1981). Scores range from 0 to 36 for emotional exhaustion, from 0 to 20 for depersonalization, and from 0 to 32 for personal accomplishment subscale. The standard cut-off values were used to define low, moderate, and high levels in each dimension (Maslach et al. 1996; Maslach and Jackson 1981).

We calculated the “average daily workload” by multiplying the number of shifts per month by the number of work hours per shift divided by 30. We also defined “high burnout” as obtaining a moderate or high score in either

emotional exhaustion or depersonalization axes, the two factors sometimes referred to as the core of burnout (Walkey and Green 1992).

Upon completion of the study period, the data were downloaded from the online survey tool entered into an excel spreadsheet and anonymized. These data were, then, imported into the statistical software for analysis.

Descriptive analyses were conducted to examine all baseline characteristics of the participants and the outcome variables. Means and standard deviations (SDs) were calculated for continuous variables, while frequencies and percentages were produced for categorical variables. All reported *p* values are two-tailed, and *p* < 0.05 was considered statistically significant. To explore the risk factors associated with the development of burnout, multivariable logistic regression models were used. Odds ratios and corresponding 95% confidence intervals (CI) were reported.

## Results

We invited a total of 1002 healthcare workers to participate in the study, from which 645 people completed the survey (response rate: 64.4%). Thirty respondents declared that they had not taken care of COVID-19 patients, leaving a total of 615 completed questionnaires for analysis.

Table 1 illustrates the baseline characteristics as well as the mean MBI scores in each subscale.

Our findings showed that 55 (8.9%), 252 (41.0%), and 308 (50.1%) people experienced low, moderate, and high levels in the emotional exhaustion axis, respectively. In the depersonalization axis, the values for low, moderate, and high levels of burnout were 5 (0.8%), 529 (86.0%), and 81 (13.2%), respectively. In addition, only one (0.8%) participant scored low in personal accomplishment axis, while 88 (14.3%) and 526 (85.5%) people were shown to experience moderate or high levels, respectively.

Table 2 illustrates how the level of burnout in each subscale varies between different groups of participants in terms of sociodemographic variables and job category. Among the studied characteristics, gender was the only variable that was associated with high levels of all three domains of burnout. High emotional exhaustion was significantly more prevalent in females and those without children, as well as people from different job categories (most common in residents and then nurses). High levels of depersonalization were significantly more common in males and younger ( $\leq 36$  years) participants.

We noted that of all 615 participants in the study, who had completed the MBI questionnaire, 326 persons (53.0%) experienced high levels of burnout. Table 3 shows the distribution of high burnout in different groups of participants

**Table 1** Baseline characteristics of participants (*n* = 615)

Variable	Value
Age in years, Mean $\pm$ SD, (range)	34.4 $\pm$ 7.8, (22–67)
Gender, <i>n</i> (%)	
Female	403 (65.5)
Male	208 (33.8)
Prefer not to say	4 (0.7)
Marital status, <i>n</i> (%)	
Married	363 (59.0)
Single	242 (39.4)
Prefer not to say	10 (1.6)
Home living children, <i>n</i> (%)	
Yes	229 (37.2)
No	386 (62.8)
Job category, <i>n</i> (%)	
Specialist	68 (11.1)
Resident	166 (27.0)
Intern	19 (3.1)
Nurse	300 (48.8)
Other	62 (10.1)
Years in practice, Mean $\pm$ SD	8.8 $\pm$ 6.7
days working over past month, Mean $\pm$ SD	18.1 $\pm$ 9.1
hours working per shift, Mean $\pm$ SD	13.3 $\pm$ 6.5
Maslach Burnout Inventory Score, Mean $\pm$ SD	
Total score	64.2 $\pm$ 7.7
Emotional Exhaustion Subscale Score	26.6 $\pm$ 7.4
Depersonalization Subscale Score	10.2 $\pm$ 2.2
Personal Accomplishment Subscale Score	27.3 $\pm$ 3.9

*n* number, *SD* standard deviation, *COVID-19* corona virus disease 2019

based on their sociodemographic characteristics and work-related factors.

The results of multiple logistic regression analysis of different variables to detect their impact on the development of high burnout levels have been presented in Table 4. Age, gender, job category, and work site were significantly associated with burnout status; while marital status, having children, number of years in practice, and the average daily workload were not associated with this outcome.

## Discussion

The results of this cross-sectional survey demonstrated high levels of burnout in healthcare workers looking after COVID-19 patients. We also found that younger age and female gender were predisposing factors for burnout and that the level of burnout varied significantly by site of practice and job category.

**Table 2** Participant's level of burnout in each dimension by sociodemographic characteristics and job category, number (%)

	Emotional Exhaustion				Depersonalization				Personal Accomplishment			
	Low	Moderate	High	<i>P</i>	Low	Moderate	High	<i>P</i>	Low	Moderate	High	<i>P</i>
<b>Age</b>												
≤ 36 year	36 (8.9)	154(38)	215(53.1)	0.105	3 (0.7)	338 (83.5)	64 (15.8)	0.011	1 (0.2)	59 (14.6)	345 (85.2)	0.723
> 36 year	19 (9.0)	98(46.7)	93(44.3)		2 (1.0)	191 (91.0)	17 (8.1)		0 (0)	29 (13.8)	181 (86.2)	
<b>Gender</b>												
Female	30 (7.4)	148(36.7)	225 (55.8)	<0.001	3 (0.7)	359 (89.1)	41 (10.2)	0.003	0 (0.0)	45 (11.2)	358 (88.8)	0.003
Male	25 (12.0)	102 (49.0)	81 (38.9)		2 (1.0)	166 (79.8)	40 (19.2)		1 (0.5)	42 (20.2)	165 (79.3)	
<b>Marital status</b>												
Married	40 (11.0)	142 (39.1)	181 (49.9)	0.436	4 (1.1)	318 (87.6)	41 (11.3)	0.077	1 (0.3)	57 (15.7)	305 (84.0)	0.327
Single	15 (6.2)	105 (43.4)	122 (50.4)		1 (0.4)	202 (83.5)	39 (16.1)		0 (0.0)	30 (12.4)	212 (87.6)	
Other	0 (0.0)	5 (50.0)	5(50.0)		0 (0.0)	9 (90.0)	1 (10.0)		0 (0.0)	1 (10.0)	9 (90.0)	
<b>Having children</b>												
Yes	24 (10.5)	104 (45.4)	101(44.1)	0.027	2 (0.9)	206 (90.0)	21 (9.2)	0.033	1 (0.4)	43 (18.8)	185 (80.8)	0.010
No	31 (8.0)	148 (38.3)	207 (53.6)		3 (0.8)	323 (83.7)	60 (15.5)		0 (0)	45 (11.7)	341 (88.3)	
<b>Job category</b>												
Specialist	7 (10.3)	31 (45.6)	30 (44.1)	0.008	0 (0.0)	65 (95.6)	3 (4.4)	0.657	0 (0.0)	8 (11.8)	60 (88.2)	<0.001
Resident	7 (4.2)	59 (35.5)	100 (60.2)		2 (1.2)	134 (80.7)	30 (18.1)		0 (0.0)	7 (4.2)	159 (95.8)	
Intern	1 (5.3)	14 (73.7)	4 (21.1)		0 (0.0)	18 (94.7)	1 (5.3)		0 (0.0)	3 (16.8)	16 (84.2)	
Nurse	26 (8.7)	115 (38.3)	159 (53.0)		3 (1.0)	257 (85.7)	40 (13.3)		1 (0.3)	47 (15.7)	252 (84.0)	
Other	14 (22.6)	33 (53.2)	15 (24.2)		0 (0.0)	55 (88.7)	7 (11.3)		0 (0.0)	23 (37.1)	39 (62.9)	

*p p* value

Other studies have also investigated the psychological impact of COVID-19 and other infectious disease outbreaks on hospital staff. A recent rapid review of the existing literature retrieved 59 papers that described the emotional reactions of HCPs during an outbreak of viral infectious disease (Kisely et al. 2020). The investigators concluded that staff in contact with these patients had greater levels of acute or posttraumatic stress (odds ratio 1.71, 95% CI 1.28–2.29) and psychological distress (1.74, 1.50–2.03) as compared with lower risk controls (Kisely et al. 2020). Most of the studies used instruments other than MBI, and only eight were on COVID-19. Poon et al. using State–Trait Anxiety Inventory conducted a survey to identify anxiety levels among 1926 front-line healthcare workers in Hong Kong during SARS outbreak. They also used the emotional exhaustion dimension of the MBI. Mean anxiety levels (51.1 versus 47.1;  $p < 0.001$ ) and the number of burnout symptoms (7.3 versus 5.1;  $p < 0.001$ ) among front-line health care workers were higher than those among controls; anxiety scores correlated with burnout scores (2004). An online survey was performed to investigate the role of perceived SARS threat and organizational support in predicting emotional exhaustion and stated anger among 333 Canadian nurses (315 women, 18 men) (Fiksenbaum et al. 2006). In this study, mean emotional exhaustion score was 4 ( $\pm 1.85$ ). In a cross-sectional survey conducted in China, using General Health

Questionnaire, Dai et al. evaluated mental health status of a convenient sample of 4357 healthcare workers (2020). They found that 1704 workers (39.1%) had psychological distress (score  $\geq 3$ ). In another survey, Lai and colleagues assessed the magnitude of mental health outcomes of 1257 healthcare workers treating patients exposed to COVID-19 in 34 hospitals in China. They found that 634 people (50.4%) reported symptoms of depression, 560 (44.6%) anxiety, 427 (34.0%) insomnia, and 899 (71.5%) distress (2019). Moreover, Liu et al. using the Zung self-rating anxiety Scale, estimated the prevalence of anxiety among medical staff to be 12.5% (2020). Xing et al. in a cross-sectional survey using Symptom Checklist-90 (SCL-90) investigated the mental health status of 548 medical personnel dealing with COVID-19 at 12 hospitals in eight provinces and cities of China (2020). According to the findings of their study, overall average score of SCL-90 among medical personnel were significantly higher than that of the norm group. Zhu et al. evaluated stress, depression, and anxiety among 5,062 health workers using Impact of Event Scale-Revised, Patient Health Questionnaire-9, and Generalized Anxiety Disorder 7-item. In this study, 29.8 percent of participants reported stress, 13.5% depression, and 24.1% anxiety (2020). In a study by Maun-der et al. on 587 workers at Toronto Hospital, 30.4% had high emotional exhaustion (score  $\geq 27$ ) (2006). To the best of our knowledge, no prior study used MBI to assess the

**Table 3** Frequency of high burnout in different groups of participants (*n* = 615)

Variable	High burn out level, <i>n</i> (%)		<i>P</i> value
	No	Yes	
Age			0.041
≤ 36 years	177 (43.7)	228 (56.3)	
> 36 years	110 (52.4)	100 (47.6)	
Gender			0.002
Female	169 (41.9)	234 (58.1)	
Male	116 (55.8)	92 (44.2)	
Other	2 (50)	2 (50)	
Marital status			0.877
Married	172 (47.4)	191 (52.6)	
Single	110 (45.5)	132 (54.5)	
Other	5 (50.0)	5 (50.0)	
Home living children			0.030
Yes	120 (52.4)	109 (47.6)	
No	167 (43.3)	219 (56.7)	
Job category			<0.001
Intern	14 (73.7)	5 (26.3)	
Resident	58 (34.9)	108 (65.1)	
Specialist	37 (54.4)	31 (45.6)	
Nurse	134 (44.7)	166 (55.3)	
Other	44 (71.0)	18 (29.0)	
Hospital			0.002
Shohada	105 (57.1)	79 (42.9)	
Imam Hussein	107 (41.8)	149 (58.2)	
Masih Daneshvari	42 (50)	42 (50)	
Other	33 (36.3)	58 (63.7)	
Years in practice			0.042
≤ 5 years	112 (41.9)	155 (58.1)	
> 5 years	175 (50.3)	173 (49.7)	
Average daily workload <sup>a</sup>			0.561
≤ 8 h	202 (47.4)	224 (52.6)	
> 8 h	83 (44.9)	102 (55.1)	

<sup>a</sup>There were four missing values

psychological sequel of COVID-19; therefore, a comparison of the results of this study with that of previous studies is not feasible.

Burnout is a very well-known consequence of healthcare for the staff and is strongly linked to significant outcomes such as patient safety (Dewa et al. 2017; Hall et al. 2016); Moreover, MBI is a validated instrument to assess the level of burnout. Therefore, we believe that MBI is a practical and credible method for assessment of the psychological impact of COVID-19 pandemic on staff.

Our study lacked a control group but a comparison of our findings with other studies on burnout in our country before the COVID-19 pandemic shows a much higher level of burnout. A systematic review of the studies which examined the

**Table 4** Bivariate associations between high level of burnout and sociodemographic and work-related factors (*n* = 611)

Variable	OR	95% CI for OR		<i>P</i> value
		Lower limit	Upper limit	
Age <sup>a</sup>	0.97	0.95	0.99	0.010
Gender				0.015
Female	1			
Male	0.65	0.45	0.92	
Job category				<0.001
Intern	1			
Resident	6.64	2.16	20.41	0.001
Specialist	4.13	1.18	4.40	0.026
Nurse	4.56	1.54	13.48	0.006
Other	1.77	0.53	5.90	0.350
Hospital				0.011
Shohada	1			
Imam Hussein	1.86	1.25	2.78	0.002
Masih daneshvari	1.29	0.74	2.23	0.364
Other	1.96	1.08	3.53	0.026

*n* number, *yr* year, *SD* standard deviation, *CI* confidence interval, *OR* odds ratio

<sup>a</sup>Per 1 year increase

prevalence of burnout among nurses in Iran, published in 2018, found that the overall prevalence of burnout among Iranian nurses was 36% (95% CI 20–53%) (Rezaei et al. 2018). In our study, more than 55% of the nurses experienced high burnout during the COVID-19 pandemic. In a cross-sectional study conducted on 208 primary HCPs in Iran, the average score of the participants in emotional exhaustion dimension was 17.19, compared to around 27 in our study (Khosravi et al. 2017). A large study to assess the level of job burnout among 1,807 HCPs in Iran found that mean scores ( $\pm$ SD) in emotional exhaustion, depersonalization, and personal accomplishment subscales were 8.9 ( $\pm$ 9.0), 23 ( $\pm$ 2.9), and 34 ( $\pm$ 8.6), respectively (Bazmi et al. 2019); while in our study, these values were much higher: 26.6 ( $\pm$ 7.4), 10.2 ( $\pm$ 2.2), and 27.3 ( $\pm$ 3.9), respectively.

Several outbreaks of infectious diseases have occurred over the past two decades and they represent a serious threat to both health services and staff. HCPs taking care of a large number of potentially infectious victims are under great physical and psychological pressure. Therefore, it is not surprising to expect a high rate of mental health problems among the staff. Chen et al. interviewed 13 medical staff at a hospital in China during the COVID-19 outbreak and noted that “getting infected was not an immediate worry to staff” but that “they were afraid of bringing the virus to their home”. They also stated that issues such as ambiguity regarding “how to deal with patients when they were unwilling to be quarantined at the hospital or did not cooperate

with medical measures because of panic or a lack of knowledge about the disease” and “shortage of protective equipment” were also contributing to poor mental health of medical staff (2020). A study by Sahashi et al. on 4,386 HCPs in Japan also found that consequence of becoming infected, restricted social contact, and a shortage in personal protective equipment were the most frequent concerns (2019). While our study was not meant to discover the reasons for this phenomenon, several issues can be speculated to have resulted in this state of high burnout. Heavy workload, fear of contracting the disease or transmitting it to the family, as well as lack of staff support systems are often cited complaints. These are, however, anecdotal report remembered by the investigators and are not part of the formal data obtained through this study. Whether these are linked to the development of high burnout or not and the contribution of each potential factor can be the subject of future studies. This will help administrators adapt the best approach to maintain staff mental health.

Our study found age and gender to be important predisposing factors for high burnout. Our findings are in accordance with several studies showing that staff who are women (Chong et al. 2004; Lai et al. 2019; Zhu et al. 2020; Tang et al. 2016; Bukhari et al. 2016; Huang et al. 2020) or younger (Austria-Corrales et al. 2011; Nickell et al. 2004; Tam et al. 2004; Wu et al. 2009; Sim et al. 2004) are more vulnerable to psychological distress. Only in two studies, older age was a risk factor for psychological symptoms (Xing et al. 2020; Wu et al. 2009).

While some studies have found out that having children (Koh et al. 2005; Maunder et al. 2004) and having an increased contact with affected patients (Poon et al. 2004; Fiksenbaum et al. 2006; Dai et al. 2020; Lai et al. 2019; Maunder et al. 2004, 2006; Tang et al. 2016; Bukhari et al. 2016; Huang et al. 2020; Nickell et al. 2004; Tam et al. 2004; Wu et al. 2009; Koh et al. 2005; Lee et al. 2018; Kim and Choi 2016; Oh et al. 2017; Matsuishi et al. 2012; Styra et al. 2008; Liu et al. 2012; Goulia et al. 2010) are predisposing factors, our study failed to find such a relationship. Moreover, several studies have shown that being less experienced (Chong et al. 2004; Tang et al. 2016; Oh et al. 2017; Lancee et al. 2008) puts the staff at higher risk. While we found a significant difference between the experience of those with and without high burnout, this variable did not remain in the final regression model, pointing to potential co-linearity between age and experience.

Within the job categories, residents were found in this study to be at higher risk of developing high burnout. Nurses were the second at-risk group. In previous studies, nurses were generally at higher risk than doctors (Poon et al. 2004; Lai et al. 2019; Nickell et al. 2004; Tam et al. 2004; Koh et al. 2005; Maunder et al. 2004; Goulia et al. 2010; Wong et al. 2005). Lai et al., for example, reported more severe

degrees of all measurements of mental health symptoms in nurses exposed to COVID-19 (2019). However, two studies reported the opposite (Chan and Huak 2003; Lung et al. 2009). A survey of 99 residents during a H1N1 influenza virus outbreak in Mexico City conducted documented high levels of burnout among this population (Austria-Corrales et al. 2011). The reasons why residents were so vulnerable to burnout needs further study, but issues such as heavy workload, changes in duty rosters to accommodate the new needs, and cancelation of vacations, as well as having less access to personal protective equipment may have caused this unfavorable state.

The level of burnout in our study was also affected by the location of work. In a study by Maunder on 769 healthcare workers during SARS outbreak, the investigators found a significantly higher levels of burnout in the staff of one of the two studied hospitals (median score 19, interquartile [IQR] range 10–29, in one hospital versus median score 16, IQR 9–23, in the other hospital) (Maunder et al. 2006). Dai et al. found that working in primary hospitals was a poor prognostic factor (2020). In our study, working in the hospitals which were not designated as COVID-19 centers was accompanied by higher levels of burnout. We cannot provide evidence-based reasons for this finding. The investigators tried to speculate through their experience some justifications, but these are not rooted in our findings. Several reasons might account for this difference: working conditions affects perceived threat; designated hospitals are better prepared and equipped for healthcare delivery to COVID-19 patients; working in non-designated hospitals is not rewarded by recognition and incentives often found in COVID-19 designated hospitals. These guesses, again, need to be tested in future studies.

Our study has several strengths. Burnout is a well-recognized psychological consequence of working in the health-care section and its impact on staff physical and emotional health, patient safety, and quality of care is documented. The instrument used in this study is well validated across geographical areas. We used a relatively large sample with an acceptable response rate. The study population in our study come from different hospitals ranging from small district hospitals to tertiary care teaching hospitals. They also represent different job categories from ancillary staff to board-certified attending physicians and clinical teachers. This reassures us that our sample represent the total health-care providers in the country.

This study also faces some limitations. We used a convenience sampling strategy and this may have resulted in selection bias. Unfortunately, we did not have access to sociodemographic and work-related data of the non-responders to check for any potential discrepancy between responders and non-responders. Although we tried to consider several personal (e.g., marital status and having dependent children)

and work-related parameters (e.g., workload, job category), our study might have failed to deal with all contributing factors. We specifically referred to COVID-19 in our questions; however, since we did not have a control group, a comparison with other clinicians or the general population has not been performed and we cannot claim that this level of burnout is solely attributable to COVID-19 pandemic. Furthermore, the observational nature and the design of our study makes it impossible to make any inferences regarding causality. Since job descriptions and responsibilities of different healthcare providers may vary slightly in other healthcare systems, caution should be applied when generalizing the findings of this study to other settings.

In summary, our study highlighted the high prevalence of burnout among HCPs caring for patients during the new pandemic. Several personal and work-related factors contribute to the level of burnout that the staff experience. These include younger age, female gender, working as a resident or nurse, and working in non-COVID-designated hospitals.

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## Declarations

**Conflict of interest** The authors have no competing interests to declare.

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