



## Original Article

## The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country



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## ABSTRACT

**Background:** The global pandemic of coronavirus disease of 2019 (COVID-19) has led to unprecedented psychological stress on health workers (HCWs). We aimed to assess the psychological impact of COVID-19 on HCWs in comparison to the stress brought on by the Middle East respiratory syndrome coronavirus (MERS-CoV) epidemic in Saudi Arabia.

**Method:** Between February 5th and 16th, 2020, 811 health-care workers (HCWs) of a tertiary care teaching hospital were invited to fill a questionnaire regarding concerns and worries about the novel coronavirus pandemic, along with Generalized Anxiety Disorder (GAD-7) Anxiety Severity screening tool.

**Results:** Out of 582 HCWs who completed the survey questionnaire (response rate of 71.8%), about 40% were exposed previously to MERS-CoV infected or suspected patients during a previous hospital outbreak. While there were no COVID-19 cases reported yet in Saudi Arabia at the time of data collection, still, the anxiety level from COVID-19 was significantly higher than that from MERS-CoV or seasonal influenza: 41.1% were more worried about COVID-19, 41.4% were similarly worried about both MERS-CoV and COVID-19, and 17.5% were more stressed by the previous MERS-CoV hospital outbreak. The most frequent concern was transmitting the infection to family and friends (2.71/5) than to themselves only (2.57/5).

**Conclusion:** Pandemic and epidemic infectious diseases such as COVID-19 or MERS-CoV impose a significant level of anxiety and stress on healthcare workers who are caring of infected patients, with their main concern being the risk of transmitting the infection to their families or to acquire it themselves. Therefore, optimizing the compliance of healthcare workers with the proper infection prevention and control measures is paramount during the infectious disease outbreak, to ensure their safety, to decrease the likelihood of getting infected or transmitting the infection to others, and consequently to alleviate their psychological stress and anxiety.

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**Abbreviations:** COVID-19, coronavirus disease 2019; HCWs, health workers; GAD-7, Generalized Anxiety Disorder; MERS-CoV, Middle East respiratory syndrome (MERS)-coronavirus; SARS-CoV-2, severe acute respiratory syndrome coronavirus-2; WHO, World Health Organization; SARS, Severe acute respiratory syndrome; IHR, International Health Regulation; PHEIC, Public Health Emergency of International Concern; ICU, Intensive Care Units.

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## Introduction

Severe acute respiratory syndrome coronavirus-2 (SARS-CoV-2) the etiological agent for coronavirus disease 2019 (COVID-19) first reported from China on 31st of December 2019 as a cause of pneumonia and since then has spread to many countries around the globe which led the World Health Organization (WHO) to announce it as a worldwide pandemic on 11th of March 2020 [1]. Facing this large-scale infectious public health event, health care workers (HCWs) are under immense physical and psychological stress.

HCWs generally are at risk of exposure to highly infectious pathogens while they care for patients or by exposure to patient environment or biological samples. This may worry them of being infected and transmitting infection to family members [2–3]. Such fear may have negative effects. HCWs exposed to severe acute respiratory syndrome (SARS) outbreak in 2002–2003 experienced high levels of psychological stress due to quarantine, reporting, body temperature monitoring and eventually ending a refusal to care for patients [4–5]. They also needed to deal with the unpredictability of their work schedule, which necessitates them to adjust their private and social life. The consequences of stress may last long after the outbreak and may result in depression or post-traumatic stress disorder [6–7].

During the SARS outbreak, one-fifth of all cases were in health care workers [2,8]. Mass numbers of HCWs catching the disease puts the already tight health care systems under higher pressure. Saudi Arabia has been dealing with another corona virus, Middle East respiratory syndrome coronavirus (MERS-CoV), since 2012 [9–10]. As of March, 2020 there has been 2494 laboratory-confirmed MERS cases, including 858 deaths (34.4%) worldwide. Although MERS CoV has low overall human to human transmission potential, there is sporadic amplification in the healthcare setting accounting for 38% of all reported infections [11]. HCW related infections account for 1–27% of the total number of MERS CoV cases [12]. Therefore there have been multiple published researches identifying related psychological impact on in healthcare settings during MERS-CoV outbreak [13–16], so far there has not been any study to compare the anxiety level among HCWs in Saudi Arabia during the COVID-19 pandemic and to compare that anxiety to the previous experience during MERS-CoV outbreak.

This study aimed to assess health care worker's anxiety during the current COVID-2019 pandemic and to compare it to that of the MERS-CoV epidemic in Saudi Arabia. It also explores potential influencing factors that could affect differences in perceived anxiety among HCWs.

## Methodology

The study was carried out between February 5th and 16th, 2020, at the King Khalid University Hospital (KKUH), Riyadh, Saudi Arabia, a tertiary care teaching hospital with 850 beds providing secondary and tertiary care. After the World Health Organization (WHO) International Health Regulation (IHR) emergency committee declaration that the disease was a Public Health Emergency of International Concern (PHEIC) on January 30, 2020 [17], there was an increase concern and fear towards this emerging infectious disease.

To assess HCWs' concerns, worries and their knowledge regarding COVID-19, their past exposure to MERS-COV (proven or suspected patients), intended behavior during the pending pandemic and whether these factors were associated with psychological stress, a pilot-validated self-reported questionnaire was administered, along with a request for demographic characteristics [14]. The questionnaire asked about previous exposure to MERS-CoV proven or suspected cases, as there were no COVID-19 cases

reported in Saudi Arabia at the time of data collection. The knowledge section of the survey asked general questions on COVID-19 modes of transmission, signs, and symptoms; and preventive measures. The respondents were asked to rate their "anxiety" level on a 1–5 scale (higher reported scores denoting higher anxiety level) regarding the possibility of acquisition of COVID-19 as compared to the previous experience with the MERS-CoV outbreak that was previously encountered at this hospital; and the possibility of transmitting it to a family member, followed by questions to delineate the triggers and roots of this anxiety, with items focused on virulence, lack of effective treatment, prognosis or source of information.

## Recruitment

HCWs in all the hospital's departments and clinical units, including the intensive care unit and emergency departments, were asked to participate in the study. Participants were selected using a convenience sampling technique. An electronic survey link was sent via email through SurveyMonkey. Prior to conducting the survey, the purpose of the study was explained at the beginning of the electronic survey. The respondent was given the opportunity to ask questions via a dedicated email address for the study. Waiver for signed consent was requested since the study presents no more than minimal risk of harm to subjects and involved no procedures for which written consent is normally required outside the study context. Personal identifiers were not collected to ensure confidentiality. The study was approved by the Institutional Review Board at the College of Medicine and King Khalid University Hospital (approval # 20/0065/IRB).

## Statistical analysis

The data was analyzed using SPSS IBM V20 (SPSS, Inc., Chicago, IL, USA). For all tests, statistical significance was set at  $p < 0.05$ . Summary statistics for all variables were calculated. The summative analysis was used to summarize the scores from continuous Likert's scale-based questions. Fisher's exact tests were used to establish the difference between HCW groups (physicians vs. non-physicians) for nominal variables. To assess which items predicted the outcome of knowledge, anxiety, and social behavior, logistic regression analyses were performed, adjusted for HCWs sex, years of experience, anxiety toward acquiring COVID-19, and social avoidance.

## Results

A total of 582 out of 811 health care workers (HCWs) completed the survey questionnaire (response rate of 71.8%). Of those, 437 (75%) were female, with nurses representing 62.4% ( $n = 363$ ). The survey included all hospital clinical units, with 261 (44.8%) responses from acute care areas (Intensive Care Units and emergency departments), followed by staff from outpatient clinics 163 (28%), then general hospital wards 133 (19.4%). (See [Table 1](#)) The annual compliance with seasonal influenza vaccine among all HCWs enrolled in the survey was 65.8%, while 70.6% received it this year.

Nearly 40% dealt with MERS-CoV infected patients during the previous hospital outbreak. Most of the HCWs (84.7%) reported that they will not consider rescheduling or changing their work time to avoid contact with patients infected with either coronavirus.

Based on the 1–5 worry rating scale, it showed staff are more anxious about transmitting COVID-19 to a family member rather than acquiring the infection themselves (2.71/5 (1.22) versus 2.57/5 (1.10).

**Table 1**  
Descriptive statistics of the healthcare workers' demographic and professional characteristics.

	Frequency	Percentage
<b>Sex</b>		
Female	437	75.1
Male	145	24.9
<b>Age (years), mean (SD)</b>		36.02 (8.50)
≤30 years	178	30.6
31–39 years	223	38.3
40–49 years	133	22.9
≥50 years	48	8.2
<b>Clinical role</b>		
Senior physician	56	9.6
Registrar physician	52	8.9
Resident physician	48	8.2
Interns	34	5.8
Nurse & midwife	363	62.4
Auxiliary services	29	5
<b>Hospital working unit</b>		
Acute Care Units (ER and ICU)	261	44.8
General hospital floors	113	19.4
Auxiliary services	26	4.5
Outpatient clinics	163	28
Academic	19	3.3

Forty-one percent of staff are more stressed about COVID-19 than from MERS-CoV, and a similar percentage believe that they have similar stress to both infectious diseases.

On a scale of 0–10 for anxiety, the respondents scored higher anxiety to COVID-19 and MERS-CoV compared with seasonal influenza, 5.94/10, (SD=2.5), 5.42/10, (SD=2.82) and 3.31/10, (SD=2.60), respectively. (See Table 2)

Majority of HCWs enrolled in the survey had mild anxiety (397 (68.25%) according to Generalized Anxiety Disorder (GAD-7) scale, followed by moderate anxiety 121(20.8%), while few had high moderate 47 (8.1%) and the least had very high anxiety 17 (2.9%) (see Table 3). We found a positive correlation between the self-reported fear of each viral infection (COVID-19, MERS-CoV and seasonal influenza) and the GAD 7 score for each participant (see Fig. 1).

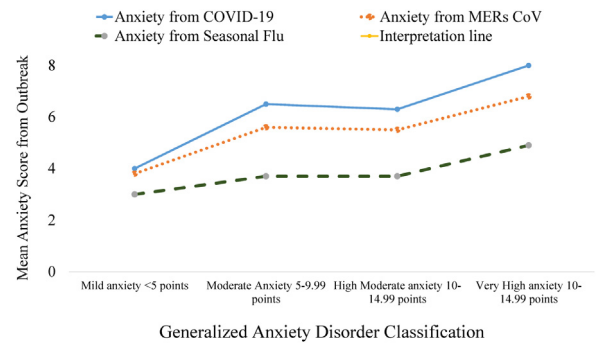
When asked about the public fear spreading with COVID-19, most respondents (67.3%) agreed that this public fear was justified and appropriate for the current situation. The majority (77.2%) also reported that such fear may have increased public awareness about the disease. Most HCWs (73.2%) agree that the current public fear

**Table 2**  
Descriptive statistics of healthcare workers general experience with COVID-19 and other viral outbreaks characteristics.

	Frequency	Percentage	Mean(SD)
<b>Q6</b>	<b>Previous exposure to MERS-CoV infected/suspected patients</b>		
	No previous exposure to MERS-CoV	348	59.8
	Yes previous exposure to MERS-CoV	234	40.2
	• Exposure to MERS-CoV-Infected Patient	106	18.2
	• Exposure to MERS-CoV-Suspected but screening was negative	128	22
<b>Q8</b>	<b>Will you consider rescheduling/changing your work time to avoid contact with Coronavirus infected Patients?</b>		
	No	493	84.7
	Yes	89	15.3
<b>Q9</b>	<b>I was vaccinated with the Influenza vaccine this season:</b>		
	No	171	29.4
	Yes, this year in particular	28	4.8
	Yes, Annually	383	65.8
<b>Q15</b>	<b>How worried are you in contracting COVID-19 from workplace (1–5 rating scale), mean (SD)</b>		2.57 (1.10)
<b>Q16</b>	<b>How worried are you contracting COVID-19 from workplace to a family member, mean (SD)</b>		2.71 (1.22)
<b>Q17</b>	<b>Compared to the previous MERS-CoV outbreaks in 2012–2015, how do you feel about the COVID-19?</b>		
	A Similarly worried	241	41.4
	B More stressed from COVID-19 than MERS-CoV	239	41.1
	C More stressed from MERS-CoV than COVID-19	102	17.5
<b>Q18</b>	<b>Rate how anxious were you with each of the below outbreaks (0 = Not anxious to 10 = Very anxious)</b>		
	A MERS-CoV, mean (SD) anxiety		5.42 (2.82)
	B COVID-19, mean (SD) anxiety		5.94 (2.5)
	C Seasonal influenza, mean (SD) anxiety		3.31 (2.60)

**Table 3**  
Descriptive statistics of healthcare workers generalized anxiety classification based on GAD-7 scale.

	Frequency (percentage)
Mild anxiety <5 points	397 (68.2)
Moderate anxiety 5–9.99 points	121 (20.8)
High moderate anxiety 10–14.99 points	47 (8.1)
Very high anxiety 10–14.99 points	17 (2.9)



**Fig. 1.** The association between the HCW's Generalized Anxiety with their perceived Anxiety from the previous and current viral outbreaks.

from COVID-19 is much higher than the fear that was associated with MERS-CoV outbreak.

**Discussion**

The crucial role of HCWs during a pandemic as front liners is vital and massive, making them more susceptible to anxiety and stress due to overwhelming health care systems in addition to fear of acquiring the infection [18–20]. Previous outbreaks and epidemics of various infectious diseases i.e. SARS-CoV-1, H1N1 influenza and Ebola virus proved to cause significant short and long term psychological impact on HCWs in the frontline [21–23].

The intense media coverage of the COVID-19 pandemic exacerbates perceptions of personal health. Nowadays, information is spreading more rapidly and extensively than it was during the SARS outbreak in 2003, during the H1N1 influenza pandemic in 2009, or the MERS-CoV epidemic in 2013–2015, which clearly exacerbated public fear, panic, and stress.

In the early stage of COVID-19 pandemic, infected HCWs accounted for 29% of all hospitalized COVID-19 patients [24]. Therefore, they are subject to complex emotional reactions and psychological distress. Moreover, the stress among HCWs would impair their attention, cognitive functioning, and clinical decision-making [25–26].

Hospitals are encouraged to conduct educational campaigns targeting HCWs to improve their knowledge and awareness about COVID-19 before the pending pandemic hits the actual facility. This action is a very important step to minimize the level of staff stress and prepare them for COVID-19 pandemic [27]. Additionally, the previous experience of our HCWs with the previous MERS-CoV outbreak in managing and treating suspected and confirmed cases which were reported by 40% of HCWs [28]. More interventions towards improving knowledge and skills of HCWs as well as reassuring them with the efficiency of proper infection prevention and control measures and providing a safe environment is needed.

This study explored issues with stress and anxiety at a large tertiary care hospital in Saudi Arabia. The timing of this survey was prior to WHO's official announcement of the COVID-19 pandemic which is very important from a strategic point of view in order to highlight the level of stress and anxiety within HCWs to help implement additional required measures and interventions. Moreover, we concentrated on frontline HCWs including doctors (30%) and nurses (62%) in critical and high risk areas mainly ICUs and ER (44.8%).

The infection prevention and control measures applied to MERS CoV were adapted in our institution for COVID-19, however HCWs had significantly higher anxiety scores from COVID-19 compared to MERS-CoV and seasonal influenza. This higher degree of stress was probably due to the fact that COVID-19 is a new emerging virus with uncertain contagiousness, rapidity of spread and degree of information associated with it [17]. The same observation of HCWs stress and anxiety have been noticed during the H1N1 Influenza pandemic [29].

HCWs at our institution reported major concerns of acquiring COVID-19 and subsequently transmitting it to our family member, this finding is expected and reproduced from previous similar studies [18].

During our previous hospital outbreak of MERS-CoV and as part of hospital's preparedness for the upcoming pandemic several campaigns to improve seasonal influenza uptake by HCWs were conducted and this is reflected in this study, as more than two thirds of staff received influenza vaccine, this is higher than what was reported in a previous study from Hong Kong on vaccine uptake after SARS outbreak [30].

In this study, we used Generalized Anxiety Disorder (GAD-7) as an anxiety Severity screening tool to measure the levels of anxiety and we found moderately high and very high anxiety scores at 8% and 2% respectively to COVID-19 which is far less than a previous study from Greece that showed nearly half of HCW experienced moderately high levels of worry during H1N1 influenza pandemic [29]. Japan and Singapore showed a high level of fear and anxiety in more than half of HCWs surveyed prior to and during SARS-CoV outbreaks [3,31]. We only found that 15% of HCWs considered rescheduling or changing their duty in order to avoid patients with COVID-19, this is much less than that reported in Japan during SARS which showed that 92% of HCWs preferred to avoid patients with SARS [31]. In Taiwan during SARS outbreak a survey study of HCW in ER and outpatient clinics showed that 9% of staff reported reluctance to work or had considered resignation, a similar percentage of HCWs developed acute stress disorder and twenty percent felt that they are rejected by their neighborhood and community [32–33]. Other studies highlighted the impact MERS-CoV outbreak on HCWs who were exposed to patients and were placed in quarantine, in this study, among those HCWs in

quarantine 7.6% reported anxiety symptoms and 16.6% reported feelings of anger [34–35].

Studies from Saudi Arabia during MERS-CoV outbreak showed variable levels of anxiety, in a recent study during a MERS-CoV outbreak showed that one fourth of HCWs had high level of anxiety [13], while another similar study showed a high level of positive attitude towards MERS-CoV associated with high level of knowledge about the disease [36]. Noteworthy, even medical students, attending the same hospital setting for our study, were reported to have stress associated with previous MERS-CoV outbreaks, highlighting the needed psychological support for both the students as well as the HCWs in such outbreaks [16]. Additionally, this has been demonstrated in a Chinese study that doctors have lower level of anxiety during SARS outbreak compared with other HCWs [22], while in the United Kingdom during avian influenza, two thirds of doctors felt they are not ready due to lack of knowledge and skill provided [37], the explanation is that when doctors are more knowledgeable about infectious diseases, managing patients in isolation in addition to their level of education, training and experience will have lower level of anxiety and higher positive attitude.

We believe the variability in the level of anxiety and stress among HCWs regarding emerging infectious disease pandemic depends on many factors, including study design, HCWs included, scoring system used as well as the timing of the study, prior, during or after an outbreak [38].

Comparing HCWs experience and training in this current study with a previous study [13] from the same institution by performing multivariate analysis showed significantly higher number of HCWs currently being exposed to MERS-CoV confirmed cases as well as higher number of educational campaign attendees. HCWs awareness in infection prevention and control measures, effective communication and proper information dissemination as well emotional support would have a major impact to minimize the level of anxiety and stress that will be encountered [4,29].

This study emphasizes the impact of risk of exposure of HCWs to emerging infectious diseases on their mental health, subsequently its effect on their personal and social lives, and its effect on patients' care. During the current COVID-19 pandemic, organizations are required to provide all resources to maintain a safe environment which includes complying with all infection prevention and control measures, communicated policies and providing efficient communication and dissemination of information [39]. Other important factors are managing manpower and workforce and emotional support for the HCWs during the outbreak [40–41]. Evidence-based education and training of HCWs on preparedness for the pandemic is proven to be essential to improve the experience, skills and mental wellbeing of hospital staff during a pandemic [42].

#### Study limitations

Our study had a number of inherent limitations. This was an electronic survey, and while this method is useful for rapid collection of data, and is likely to produce similar results to paper method [43], ours had a small size convenience sample, with selective recruitment of respondents. As such we did not use a random sample, and the distribution of data in our sample cannot be seen as descriptive of HCWs in other settings. Our data were collected cross-sectionally, limiting our ability to examine causal relations between the study variables and levels of anxiety, with prospective studies needed to explore the relationship between COVID-19 pandemic and anxiety levels among several groups of HCWs with different level of risk. Also, because of the cross-sectional design, we are unable to account for or comment on potential changes in anxiety levels over time. Recruitment for the study occurred over a 2-week time period shortly after WHO's announcement of COVID-19 as a Public Health Emergency of International Concern



and before its announcement of it being a pandemic. We recognize that increasing COVID-19 media coverage and information may have changed HCWs perceptions during data collection. This type of survey also introduces the potential for social desirability bias among respondents. Finally, given the convenience sample, selection bias may have been introduced from the venue selection to distribute the electronic survey link.

## Conclusion

Pandemic and epidemic infectious diseases such as COVID-19 or MERS-CoV impose a significant level of anxiety and stress on healthcare workers who are caring of infected patients, with their main concern being the risk of transmitting the infection to their families or to acquire it themselves. Therefore, optimizing the compliance of healthcare workers with the proper infection prevention and control measures is paramount during the infectious disease outbreak, to ensure their safety, to decrease the likelihood of getting infected or transmitting the infection to others, and consequently to alleviate their psychological stress and anxiety.

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## Competing interests

None declared.

## Ethical approval

Not required.

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## Appendix A. Supplementary data

Supplementary material related to this article can be found, in the online version, at doi:<https://doi.org/10.1016/j.jiph.2020.05.021>.

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