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## Original Article

## Prevalence and predictors of anxiety among healthcare workers in Saudi Arabia during the COVID-19 pandemic



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## ABSTRACT

**Background:** During pandemics, healthcare workers (HCWs) may be prone to higher levels of anxiety than those of the general population. This study aimed to explore the anxiety levels among HCWs in Saudi Arabia during the COVID-19 pandemic and the predictors of increased anxiety levels.

**Method:** HCW participants in this cross-section study were solicited by email from the database of registered practitioners of the Saudi Commission for Health Specialties between 15 May and 18 May 2020. Sociodemographic characteristics, work-related factors, and organization-related factors were collected. **Results:** Four thousand nine hundred and twenty HCWs (3.4%) responded. Reported levels of anxiety were low anxiety (31.5%; n = 1552), medium (36.1%; n = 1778), and high (32.3%; n = 1590). Participants reporting high anxiety levels were more likely to be unmarried (OR = 1.32, 95% CI: 1.14–1.52); nurses (OR = 1.54, 95% CI: 1.24–1.91); workers in radiology (OR = 1.52, 95% CI: 1.01–2.28); or respiratory therapists (OR = 2.28, 95% CI: 1.14–4.54). Social factors associated with high anxiety levels were: living with a person who is elderly (p = 0.01), has a chronic disease (p < 0.0001), has immune deficiency (p < 0.0001), or has a respiratory disease (p-value < 0.0001). Organization-related factors associated with a high level of anxiety were: working in an organization that hosts COVID-19 patients and working with such patients (p-value < 0.0001).

**Conclusion:** Self-reported medium and high levels of anxiety were present in 68.5% of HCWs in the COVID-19 pandemic. This highlights the urgent need to identify high-risk individuals to offer psychological support and provide up to date information on the pandemic. These data should help policymakers drive initiatives forward to protect and prepare HCWs psychological wellbeing.

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## Introduction

The epidemic of a novel coronavirus disease 2019 (COVID-19) began in mainland China in late 2019 and spread throughout the world to cause a global pandemic [1]. As of August 23, 2020, there were over 23 million confirmed cases and 800,000 deaths worldwide, and the pandemic had reached 220 countries and territories

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[2]. In Saudi Arabia, as of August 27, 2020, there were 311,855 confirmed COVID-19 case, with 3785 deaths [3].

Emerging infectious disease pandemics usually are accompanied by a hidden silent pandemic, namely, the psychological impact [4–7]. The general population, including healthcare workers (HCWs), are prone to this silent pandemic. HCWs, as the front-line force to control pandemics, are expected to have different levels of anxiety than those of the general population. Various factors may contribute to the perceived altered anxiety levels among HCWs, such as the fear of contracting the infection during work; fear of transmitting the infection to loved ones; scarcity of available knowledge; quality of the knowledge presented in the official portals or the social media; and shortage of personal protective equipment.

The psychological effect of epidemics on HCWs was studied during and after the severe acute respiratory syndrome (SARS) epidemic in 2002. The short-term impact of the epidemic was described among Chinese HCWs, where 68% of those surveyed experienced high levels of stress, and 57% suffered from psychological distress [5]. Moreover, HCWs who had dealt with SARS patients in their institutions surveyed 13–26 months after the epidemic, had higher rates of psychological distress and post-traumatic stress disorders than did HCWs who were not exposed to SARS patients [8].

It is not surprising that anxiety has been found associated with the current COVID-19 pandemic. In a nationwide survey conducted early in the pandemic in China, almost 35% of general-population respondents reported psychological distress [9]. A month later, when the epidemic had spread to many countries outside China, a survey of 1210 respondents from the general public in 194 cities in China found that 53.8% of respondents rated the psychological impact of the outbreak as moderate to severe; 16.5% reported moderate to severe depressive symptoms; 28.8% reported moderate to severe anxiety symptoms; 8.1% reported moderate to severe stress levels [10]. In a review of 14 studies of the psychological burden of COVID-19 pandemic on medical and non-medical hospital staff, significant stress and anxiety symptoms were reported by the surveyed staff [11]. In one of those studies, where 2299 hospital staff were surveyed, 22.6% reported mild to moderate anxiety symptoms, and 2.9% reported severe symptoms [12].

The COVID-19 pandemic is so far the largest in the current century, and none of the practicing HCWs in the world had faced a pandemic of such magnitude; thus, exploration of the psychological effect of COVID-19 among the HCWs would be especially interesting.

Our study aimed to explore the prevalence of anxiety and the main predictors for high anxiety levels among HCWs in Saudi Arabia during the current COVID-19 pandemic.

## Method

### Design

This was a nation-level cross-sectional study of participants from all the 13 administrative regions in Saudi Arabia.

### Participants

Participants eligible to participate in this study were healthcare professionals performing their medical duties during the peak time of COVID-19 in Saudi Arabia.

### Recruitment

Registered HCWs of the Saudi Commission for Health Specialties were invited to participate via email, and the responses were

collected anonymously. The study was approved by SharikHealth Institutional Review Board (IRB) number 01–2020.

### Sampling and sample size

The study used a convenience sampling technique and a self-reported online questionnaire. Assuming that there would be moderate differences between regions in terms of anxiety and sources of information, a sample of at least 80 participants per region, was required to provide a medium-effect size of 0.35 and 80% power at 95% confidence. Which gives a total sample size of at least 1040 participants [13]. Participants from the database of registered practitioners at the Saudi Commission for Health Specialties were invited to participate between 15 May and 18 May 2020.

### Survey design and validation

#### Characteristics of HCWs

In the first section, after providing online consent, participants were asked about their sociodemographic characteristics, age, gender, region, and healthcare profession. Questions also consisted of the type of facility, if the facility was in terms of receiving COVID-19 infected patients cases or not, and if the HCW was performing all their usual. In addition to the eligibility question of being currently performing their healthcare duties in a healthcare facility.

#### Information distribution

In the second section, the participants were asked about their level of satisfaction about sufficiency and the quality of information they received about COVID-19 from the healthcare institute.

#### Worry and anxiety

In the third section, participants were asked whether they worried about contracting COVID-19 and spreading it to others, the frequency and severity of worrying, and general anxiety. The worry questions were adapted from the dispositional cancer worry scale, which has a total score range between 1 to 28 [14]; using the scale, we classified the participant into three groups: low anxiety (score < 10), medium anxiety (score 10–15), and high anxiety (score > 15). The one-item question Likert scale for anxiety was used to measure general anxiety [15].

#### Facility preparedness

In the last section, the participants were asked about the preparedness of their work facility in preventive and precautionary measures.

The survey was developed by the initial group of authors using Q-Platform which was developed by SharikHealth, and linguistic validation was conducted by a focus group with 8 participants. The survey tool then was modified and piloted with 150 healthcare practitioners. The authors discussed the results of the pilot study, and minor modifications were made to improve the survey questions.

### Statistical analysis

Data were transferred to the Statistical Package for Social Sciences (SPSS), version 25, which was used for data management and analyses. Categorical variables were presented as number and percent, whereas continuous variables were presented as mean and standard deviation. A chi-square test was used to assess the association between anxiety level and various categorical variables, and the ANOVA test was used for the continuous variables. To identify significant predictors of anxiety, we carried out multivariate (mainly multinomial regression) analyses. Results were presented

as odds ratio (OR) and 95% confidence interval (CI).  $p < 0.05$  was used to indicate statistical significance.

## Results

The survey was delivered to 143,187 registered HCWs via email through the Saudi Commission for Health Specialties. Our sample of 4920 HCWs was collected in four days (response rate of 3.4%). When divided into three groups according to anxiety level on the worry scale, 1552 (31.5%), 1778 (36.1%), and 1590 (32.3%) participants were in the low, medium, and high anxiety groups, respectively.

Personal and sociodemographic information gathered in the first part of the survey and its relation to anxiety levels described in section three is presented in Table 1. Participants reporting high anxiety levels were more likely to be unmarried (OR = 1.32, 95% CI: 1.14–1.52). Additionally, a high anxiety level was associated with smoking, having chronic diseases, and having <5 years of experience, compared to those who reported “Medicine” as their professional field, high anxiety level was associated with “Nursing” (OR = 1.54, 95% CI: 1.24–1.91), “Radiology” (OR = 1.52, 95% CI: 1.01–2.28), and “Respiratory therapy” (OR = 2.28, 95% CI: 1.14–4.54), whereas anxiety level was not significantly associated with any of the other professional specializations. No significant difference in anxiety level was reported among participants from the 13 administrative regions of Saudi Arabia. Furthermore, HCWs who reported being anxious before the current pandemic, or who had been prescribed medications to relieve anxiety before the pandemic, were more likely to be more worried during the current COVID-19 pandemic than were HCWs who had not reported a history of anxiety. Similarly, participants who reported a high level of anxiety were more likely to have sought help from a mental health professional or were considering seeking such help.

HCWs who reported high anxiety level were associated with living with one of the following persons living in the same residence as the HCW: an elderly person ( $p = 0.01$ ), a person with chronic disease ( $p < 0.0001$ ), a person with immune deficiency ( $p < 0.0001$ ), or a person with respiratory disease ( $p < 0.0001$ ). Moreover, higher anxiety levels were if the HCW had a friend, coworker, or family member who had been diagnosed with COVID-19, or they themselves had been isolated due to a suspected COVID-19 infection. As expected, high anxiety levels were also associated with HCWs who perceived themselves at a high risk of contracting COVID-19 ( $p < 0.0001$ ).

Table 2 presents the associations of organization factors, job-related factors, and preparedness of the workplace, with anxiety level. Participants reporting a high level of anxiety were more likely to be working in an organization that hosts COVID-19 patients and to have a job that requires dealing with such patients ( $p$ -value  $< 0.0001$ ). Furthermore, HCWs who reported that their organization provided frequent communication and updates about COVID-19 and provided COVID-19 tests for all HCWs were less likely to have a high level of anxiety. Adding to that, HCWs who worked in an organization that had a documented outbreak-management plan were likely to be less anxious.

Using social media as a source of information for COVID-19 was associated with a higher level of anxiety among the surveyed HCWs. HCWs who reported that the information they received from scientific and official portals or social media as not sufficient, reported low-level anxiety (35.8%), medium-level anxiety (40.4%), and high-level anxiety (40.9%) ( $p$ -value  $< 0.0001$ ). HCWs also rated the quality of the information they received about COVID-19 on a scale of 1–5; the HCWs with low, medium, and high anxiety levels reported

average scores of 3.86 (sd 1.14), 3.58, (sd 1.08), and 3.34 (sd 1.19), respectively.

Table 3 reports the results of the multivariate regression analyses for the predictors of anxiety. After adjustment for most of the demographic and background variables, high anxiety was associated with being a smoker and having a chronic disease. Among professions, nursing, radiology, and respiratory therapy were significantly associated with high anxiety.

## Discussion

This study surveyed a large sample of HCWs working in Saudi Arabia during the COVID-19 pandemic and evaluated their level of anxiety during this time. Data showed that 32.3% of HCWs surveyed have a high anxiety level, and 68.5% have medium- or high-level anxiety. Many factors were associated with high anxiety levels; the factors can be categorized into three themes: individual, social, and organizational. Individual factors associated with high anxiety levels were being a smoker, living with a chronic disease, being a nurse, having a high self-perceived risk of getting COVID-19, and previous history of anxiety. Social factors that were associated with a high anxiety level were living with an elderly person, a person with chronic disease, a person with immune deficiency, or a person with respiratory disease. In addition, HCWs who had a coworker, friend, or family member tested positive for COVID-19 were more likely to report a high level of anxiety. Organizational factors that were related to increased anxiety levels were lack of regular communication and updates from the organization, insufficient and unsatisfactory quality of information about COVID-19, lack of access to COVID-19 testing for the staff, and lack of a crisis management plan; These findings are consistent with other studies looking at the impact of COVID-19 on the mental health of HCWs [16,17].

Policymakers having to make national decisions on health-care organizations and provisions will benefit from data generated in this and other studies looking at the impact of COVID-19 on frontline workers. This study offers potential predictors of anxiety for HCWs and considering these and applying strategies in crisis management plans to identify high-risk HCWs will allow for better management of stress, anxiety, and mental health issues on workers. This survey offers a voice of the HCWs for policy decision-makers. Ensuring regular and reliable communication of COVID-19, providing PPEs, and offering professional support for those already feeling anxious will reduce the burden on these HCWs.

Several studies among HCWs in other countries have found similar findings: A systematic review and meta-analysis found that nurses and female health providers had higher rates of affective symptoms than did male and medical staff; also the prevalence of insomnia was 38.9% in five studies [16]. Another study from New York city, USA had surveyed 657 HCWs, 33% of them had a positive screen for anxiety symptoms. Nurses were also more likely than attending physicians to screen positive for anxiety (40% vs. 15% [ $p = 0.001$ ]) [18]. Obviously, nursing staff has longer and more close contact with patients compared to other professionals, providing the round-the-clock care that COVID-19 patients need. Thus, these results highlight the importance of focusing on nursing staff via monitoring and screening to detect, treat and hopefully prevent anxiety.

A similar study conducted in Saudi Arabia in February 2020, looking at HCWs anxiety levels during the COVID-19 pandemic [19]. Using the GAD-7 Anxiety scale, it found that about one-third of the studied HCWs reported moderate to high anxiety; 20.8% had moderate anxiety; 8.1% had high-moderate anxiety, and 2.9% had very high anxiety. However, this study was conducted when not one case had been recorded in Saudi Arabia. By applying this data with

**Table 1**  
Healthcare worker demographic and background information in relation to anxiety level reported.

	Total n = 4920	Anxiety level (Tertile)			p-Value	10–15 (Reference <10) OR (95%CI)	>15 (Reference <10) OR (95%CI)			
		Low <10 n = 1552	Medium 10–15 n = 1778	High >15 n = 1590						
<b>Age</b>	34.11 ± 8.13	34.96 ± 8.76	34.20 ± 8.17	33.18 ± 7.32	<0.001	0.99 (0.98–1.0)	0.97 (0.96–0.98)			
<b>Gender</b>										
Male	2307 (46.9)	801 (51.6)	898 (50.5)	608 (38.2)	<0.0001	Reference	Reference			
Female	2613 (53.1)	751 (48.4)	880 (49.5)	982 (61.8)		1.05 (0.91–1.19)	1.72 (1.50–1.99)			
<b>Marital status</b>										
Married	2983 (60.6)	977 (63.0)	1111 (62.5)	895 (56.3)	<0.0001	Reference	Reference			
Unmarried	1937 (39.4)	575 (37.0)	667 (37.5)	695 (43.7)		1.02 (0.89–1.17)	1.32 (1.14–1.52)			
<b>Region</b>										
Riyadh	1627 (33.1)	455 (29.3)	602 (33.9)	570 (35.8)	0.02					
Makkah	1042 (21.2)	323 (20.8)	392 (22.0)	327 (20.6)						
Eastern Region	853 (17.3)	264 (17.0)	308 (17.3)	281 (17.7)						
Madinah	255 (5.2)	84 (5.4)	90 (5.1)	81 (5.1)						
Asir	247 (5.0)	90 (5.8)	93 (5.2)	64 (4.0)						
Qassem	209 (4.2)	80 (5.2)	63 (3.5)	66 (4.2)						
Jazan	202 (4.1)	76 (4.9)	58 (3.3)	68 (4.3)						
Tabuk	116 (2.4)	41 (2.6)	43 (2.4)	32 (2.0)						
Hail	98 (2.0)	40 (2.6)	34 (1.9)	24 (1.5)						
Najran	85 (1.7)	34 (2.2)	31 (1.7)	20 (1.3)						
Jouf	71 (1.4)	29 (1.9)	23 (1.3)	19 (1.2)						
Baha	61 (1.2)	20 (1.3)	21 (1.2)	20 (1.3)						
Northern borders	54 (1.1)	16 (1.0)	20 (1.1)	18 (1.1)						
<b>Profession</b>										
Medicine	734 (14.9)	246 (15.9)	272 (15.3)	216 (13.6)				<0.0001	Reference	Reference
Nursing	1913 (38.9)	540 (34.8)	643 (36.2)	730 (45.9)					1.08 (0.88–1.33)	1.54 (1.24–1.91)
Pharmacy	580 (11.8)	210 (13.5)	238 (13.4)	132 (8.3)	1.03 (0.80–1.32)	0.72 (0.54–0.95)				
Medical laboratories	365 (7.4)	132 (8.5)	145 (8.2)	88 (5.5)	0.99 (0.74–1.33)	0.76 (0.55–1.05)				
Dentistry	299 (6.1)	99 (6.4)	111 (6.2)	89 (5.6)	1.01 (0.74–1.40)	1.02 (0.73–1.44)				
Radiology	193 (3.9)	51 (3.3)	74 (4.2)	68 (4.3)	1.31 (0.88–1.95)	1.52 (1.01–2.28)				
Physical Therapy	107 (2.2)	39 (2.5)	37 (2.1)	31 (1.9)	0.86 (0.53–1.39)	0.91 (0.55–1.50)				
Respiratory therapy	52 (1.1)	13 (0.8)	13 (0.7)	26 (1.6)	0.90 (0.41–1.99)	2.28 (1.14–4.54)				
Other	677 (13.8)	222 (14.3)	245 (13.8)	210 (13.2)	1.00 (0.78–1.28)	1.08 (0.83–1.40)				
<b>Specialization</b>										
Internal medicine	167 (15.6)	42 (12.1)	61 (16.3)	64 (18.2)	0.58	Reference	Reference			
Pediatrics	141 (13.2)	44 (12.7)	53 (14.2)	44 (12.5)		0.83 (0.47–1.45)	0.66 (0.37–1.16)			
Emergency Medicine	130 (12.1)	41 (11.8)	44 (11.8)	45 (12.8)		0.74 (0.41–1.32)	0.72 (0.41–1.28)			
Surgery	123 (11.5)	38 (11.0)	44 (11.8)	41 (11.7)		0.80 (0.44–1.43)	0.71 (0.39–1.28)			
Family medicine	117 (10.9)	34 (9.8)	40 (10.7)	43 (12.3)		10.81 (0.44–1.48)	0.83 (0.46–1.50)			
OB-GYN	69 (6.4)	22 (6.4)	24 (6.4)	23 (6.6)		0.75 (0.37–1.51)	0.69 (0.34–1.39)			
Psychiatry	18 (1.7)	9 (2.6)	5 (1.3)	4 (1.1)		0.38 (0.12–1.22)	0.29 (0.08–1.01)			
Dermatology	11 (1.0)	6 (1.7)	2 (0.5)	3 (0.9)		0.23 (0.04–1.19)	0.33 (0.08–1.38)			
Neurology	6 (0.6)	3 (0.9)	1 (0.3)	2 (0.6)		0.23 (0.02–2.28)	0.43 (0.07–2.73)			
Other	289 (27.0)	107 (30.9)	100 (26.7)	82 (23.4)		0.64 (0.40–1.04)	0.50 (0.31–0.82)			
<b>Children</b>	2647 (53.8)	868 (55.9)	976 (54.9)	803 (50.5)		0.005	0.96 (0.83–1.10)	0.80 (0.70–0.93)		
<b>Cigarette smoker</b>										
No, never	4042 (82.2)	1285 (82.8)	1486 (83.6)	1271 (79.9)	0.02	Reference	Reference			
Yes	878 (17.8)	267 (17.2)	292 (16.4)	319 (20.1)		0.95 (0.79–1.13)	1.21 (1.01–1.45)			
<b>Any chronic disease</b>	547 (11.1)	147 (9.5)	185 (10.4)	215 (13.5)	0.001	1.11 (0.88–1.39)	1.49 (1.20–1.87)			
<b>Health care worker</b>	3762 (76.5)	1121 (72.2)	1351 (76.0)	1290 (81.1)	<0.0001	1.22 (1.04–1.42)	1.65 (1.40–1.96)			
<b>Experience, years</b>										
<5 years	1588 (32.3)	472 (30.4)	550 (30.9)	566 (35.6)	0.003	Reference	Reference			
≥5 years	3332 (67.7)	1080 (69.6)	1228 (69.1)	1024 (64.4)		0.98 (0.84–1.13)	0.79 (0.68–0.92)			

our own, which recorded anxiety during the pandemic, it offers an interesting view of how anxiety levels have evolved in HCWs before and during the crisis. What would be interesting is to evaluate anxiety as the numbers start to fall and lockdown restrictions start to loosen. One would predict that anxiety levels would drop in number but on the other hand, perhaps there will be an increase in HCWs reporting post-traumatic stress symptoms.

What is clear is that we need to support and protect our HCWs at all stages of the pandemic.

Given the nature of a self-report survey, we wonder whether unconscious processes might have affected individuals' responses to high-stress situations. For example, that HCWs who indicated that they "don't think they will get COVID-19" (despite the availability of the choice "very low risk") suggests that the unconscious defense mechanism of denial played a role in their responses. Not surprisingly, this group (5.3% of respondents) reported a low-

level of anxiety. It is inconceivable, though, at an intellectual, logical level, that a health care practitioner would deny the possibility of getting infected. Defense mechanisms are well-studied unconscious processes that protect the conscious mind from what might be overwhelming anxiety [20]. Discussion of defense mechanisms that may be at work when self-reporting anxiety in such an unsettling situation is beyond the scope of this presentation, but clinicians and decision-makers should be aware of such mechanisms.

Another response that stood out in our survey was that married individuals and those with children below 15 years of age claimed lower levels of anxiety, which is counterintuitive to what one would think: we thought that the fear of transmitting illness to one's family might result in more distress amidst the pandemic. To expand on this, the concept of "death anxiety" is relevant. There are psychological models and psychotherapies that primarily deal with death



**Table 2**  
Healthcare worker response to information, job-related factors, and preparedness of the workplace according to anxiety level reported.

	Total n = 4920	Anxiety level (tertile)			p-Value
		Low <10 n = 1552	Medium 10–15 n = 1778	High >15 n = 1590	
<b>Working in an organization that host COVID-19 patients</b>	2738 (55.7)	816 (52.6)	957 (53.8)	965 (60.7)	<0.0001
<b>Previous experience in dealing with pandemic/epidemic</b>	1874 (38.1)	595 (38.3)	646 (36.3)	633 (39.8)	0.11
<b>Nature of job requires dealing with COVID-19 patients</b>	2570 (52.2)	734 (47.3)	898 (50.5)	938 (59.0)	<0.0001
<b>Residence during COVID-19 pandemic</b>					
Moved to a different residence	422 (8.6)	125 (8.1)	149 (8.4)	148 (9.3)	0.43
Still living in the same residence	4498 (91.4)	1427 (91.9)	1629 (91.6)	1442 (90.7)	
<b>Household contacts include:</b>					
An elderly person	1093 (22.2)	310 (20.0)	396 (22.2)	387 (24.3)	0.01
A person with chronic disease	1014 (20.6)	274 (17.7)	349 (19.6)	391 (24.6)	<0.0001
A person with immune deficiency	272 (5.5)	57 (3.7)	106 (6.0)	109 (6.9)	<0.0001
A person with respiratory disease	453 (9.2)	95 (6.1)	170 (9.6)	188 (11.8)	<0.0001
Children below 15 years old	1948 (39.6)	589 (38.0)	742 (41.7)	617 (38.8)	0.06
<b>A coworker, friend, or family member has been diagnosed with COVID-19</b>	1025 (20.8)	225 (14.5)	353 (19.9)	447 (28.1)	<0.0001
<b>HCWs who were isolated due to suspected COVID-19</b>	606 (12.3)	144 (9.3)	204 (11.5)	258 (16.2)	<0.0001
<b>HCWs who reported anxiety before 2020</b>	2.33 ± 1.27	1.73 ± 0.93	2.31 ± 1.12	2.92 ± 1.42	<0.001
<b>HCWs who were prescribed any treatment for anxiety relief before 2020</b>	299 (6.1)	72 (4.6)	99 (5.6)	128 (8.1)	<0.0001
<b>Perception of the risk getting COVID-19</b>					
High	1887 (38.4)	294 (18.9)	641 (36.1)	952 (59.9)	<0.0001
Low	2774 (56.4)	1101 (70.9)	1092 (61.4)	581 (36.5)	
I don't think I will get COVID-19	259 (5.3)	157 (10.1)	45 (2.5)	57 (3.6)	
<b>HCWs who attended online seminars to deal with stress</b>	1928 (39.2)	598 (38.5)	736 (41.4)	594 (37.4)	0.046
<b>HCWs who are interested in attending online seminars to deal with stress</b>	3516 (71.5)	982 (63.3)	1298 (73.0)	1236 (77.7)	<0.0001
<b>Using social media to get information about COVID-19</b>	4167 (84.7)	1239 (79.8)	1528 (85.9)	1400 (88.1)	<0.0001
<b>Perception on the sufficiency of information received from scientific portals and social media</b>					<0.001
Not sufficient	1925 (39.1)	556 (35.8)	719 (40.4)	650 (40.9)	
Sufficient	2995 (60.9)	996 (64.2)	1059 (59.6)	940 (59.1)	
<b>HCWs who rated the quality of information received about COVID-19 as high quality, (1 = poor quality, 5 = excellent quality) mean (SD)</b>	3.59 ± 1.15	3.86 ± 1.14	3.58 ± 1.08	3.34 ± 1.19	
<b>1</b>	252 (5.1)	73 (4.7)	62 (3.5)	117 (7.4)	<0.001
<b>2</b>	571 (11.6)	121 (7.8)	209 (11.8)	241 (15.2)	
<b>3</b>	1471 (29.9)	340 (21.9)	574 (32.3)	557 (35.0)	
<b>4</b>	1270 (25.8)	437 (28.2)	505 (28.4)	328 (20.6)	
<b>5</b>	1356 (27.6)	581 (37.4)	428 (24.1)	347 (21.8)	
<b>HCWs who were anxious because of lack of knowledge about infection control, (1 = total agree, 7 = not at all), mean (SD)</b>	5.87 ± 1.56	6.56 ± 0.99	5.92 ± 1.42	5.14 ± 1.83	
<b>1</b>	144 (2.9)	12 (0.8)	34 (1.9)	98 (6.2)	<0.001
<b>2</b>	128 (2.6)	14 (0.9)	34 (1.9)	80 (5.0)	
<b>3</b>	210 (4.3)	16 (1.0)	63 (3.5)	131 (8.2)	
<b>4</b>	387 (7.9)	30 (1.9)	132 (7.4)	225 (14.2)	
<b>5</b>	513 (10.4)	68 (4.4)	236 (13.3)	209 (13.1)	
<b>6</b>	1029 (20.9)	253 (16.3)	427 (24.0)	349 (21.9)	
<b>7</b>	2509 (51.0)	1159 (74.7)	852 (47.9)	498 (31.3)	
<b>HCWs who sought help from a mental health professional during the current pandemic</b>	392 (8.0)	59 (3.8)	108 (6.1)	225 (14.2)	<0.0001
<b>HCWs who are considering seeking help from a mental health professional after COVID-19</b>	715 (14.5)	106 (6.8)	222 (12.5)	387 (24.3)	<0.0001
<b>Organization provided continuous information about COVID-19</b>	3783 (76.9)	1228 (79.1)	1376 (77.4)	1179 (74.2)	0.003
<b>Organization provided regular COVID-19 checks on HCWs</b>					
Yes, on all healthcare workers	1862 (37.8)	646 (41.6)	687 (38.6)	529 (33.3)	<0.0001
Yes, only on those who deal with COVID-19 patients directly	1092 (22.2)	328 (21.1)	404 (22.7)	360 (22.6)	
No regular COVID-19 checks for healthcare workers	1158 (23.5)	278 (17.9)	409 (23.0)	471 (29.6)	
I don't know	808 (16.4)	300 (19.3)	278 (15.6)	230 (14.5)	
<b>Availability of :</b>					
PPEs (gloves/facemasks/gowns)	4679 (95.1)	1470 (94.7)	1698 (95.5)	1511 (95.0)	0.57
Hand sanitizer	4587 (93.2)	1442 (92.9)	1673 (94.1)	1472 (92.6)	0.18
Ventilators	2367 (48.1)	721 (46.5)	859 (48.3)	787 (49.5)	0.23
Prevention or crises management plan	2728 (55.4)	892 (57.5)	1006 (56.6)	830 (52.2)	0.006
Infection control unit or team	3053 (62.1)	959 (61.8)	1091 (61.4)	1003 (63.1)	0.57

anxiety and view it as an influential force, albeit hidden, in our psychological world [21]. Undoubtedly, a pandemic of this magnitude is expected to stir this hidden anxiety. The reproductive drive that

propels humankind to mating has been hypothesized to be an antidote to death anxiety [22]. In this context, we wonder if the lower levels of anxiety among married individuals and individuals with

**Table 3**  
Multivariate multinomial regression for predictors of anxiety predictors of anxiety.

	10–15 (reference: <10)			>15 (reference: <10)				
	OR	95%CI	p-Value	OR	95%CI		p-Value	
Age	0.98	0.97	0.99	<0.0001	0.97	0.96	0.98	<0.0001
Gender (reference: female)	0.99	0.84	1.18	0.95	0.64	0.54	0.77	<0.0001
Marital status (reference: married)	0.96	0.78	1.19	0.73	1.09	0.88	1.35	0.45
Children (reference: no)	1.03	0.84	1.28	0.75	1.18	0.95	1.47	0.14
Cigarette smoke (reference: no)	0.95	0.78	1.15	0.59	1.49	1.22	1.81	<0.0001
Chronic disease any (reference: no)	1.22	0.96	1.55	0.10	1.83	1.44	2.32	<0.0001
Experience, years (reference: <5 years)	1.11	0.91	1.35	0.29	1.05	0.86	1.29	0.62
Profession (reference: medicine)								
Nursing	1.02	0.76	1.36	0.90	1.44	1.06	1.95	0.02
Pharmacy	0.95	0.69	1.31	0.76	0.79	0.56	1.12	0.19
Medical laboratories	0.92	0.64	1.31	0.63	0.66	0.44	0.97	0.03
Dentistry	0.99	0.69	1.42	0.96	1.07	0.72	1.58	0.74
Radiology	1.22	0.79	1.90	0.36	1.49	0.94	2.35	0.09
Physical therapy	0.80	0.47	1.34	0.39	0.80	0.46	1.38	0.42
Respiratory therapy	0.84	0.37	1.90	0.68	1.96	0.94	4.06	0.07
Other	0.94	0.69	1.29	0.71	1.00	0.72	1.41	0.98
Specialization (reference: internal medicine)								
Pediatrics	0.86	0.49	1.50	0.59	0.70	0.39	1.26	0.23
Emergency medicine	0.73	0.41	1.31	0.29	0.77	0.43	1.39	0.39
Surgery	0.83	0.46	1.50	0.5	0.81	0.44	1.48	0.50
Family medicine	0.79	0.43	1.44	0.44	0.77	0.42	1.42	0.41
OB-GYN	0.74	0.37	1.50	0.41	0.64	0.31	1.31	0.22
Psychiatry	0.40	0.12	1.28	0.12	0.30	0.08	1.06	0.06
Dermatology	0.24	0.05	1.25	0.09	0.31	0.07	1.33	0.11
Neurology	0.21	0.02	2.14	0.19	0.36	0.05	2.46	0.30
Other	0.76	0.49	1.18	0.22	0.54	0.35	0.83	0.01

children during this unprecedented pandemic are a unique way to point to this characteristically hidden, ubiquitous worry – the worry of dying. It might be as if these persons have won rounds against death anxiety, so to speak. The higher anxiety levels among those who smoke, compared with non-smokers, also point toward thoughts about one's own mortality, should they get the infection. Those who were isolated due to COVID-19 had a higher anxiety level, which could be related to breaking the barrier of denial, with death anxiety lurking beneath it.

We believe that our research has highlighted some of the factors associated with higher levels of anxiety that could help decision-makers and clinicians identify and offer help to practitioners who have high anxiety levels. Practitioner's stress has been found associated with an increased rate of patient-safety incidents, poor quality of care due to low professionalism, and reduced patient satisfaction [23]. In our study, practitioners with high anxiety indicated they would be interested in attending online webinars on how to deal with stress, and were more likely to seek help; 24.3% of those with high anxiety level said they plan to seek help from a mental health professional after the current pandemic, while only 14.2% of HCWs with high anxiety said they are currently seeking help. Making mental health resources accessible and effective likely will be beneficial.

This study has limitations. First, the response rate was low, and that might be attributed to the short time given to respond (only 4 days) where a busy HCW did not have time to respond, however, we think that the large sample size compensated for the low response rate and achieved the desired power. Since we recruited HCWs via email, those who responded may have been those interested in exploring how they feel; thus, we might have heard from the more self-aware individuals and consequently overestimated anxiety. Conversely, individuals who were too overwhelmed to participate in a voluntary questionnaire might have opted out, resulting in an underestimation of anxiety. Thus, given the effect of opposite forces on our results, we believe it likely that our sample is balanced. Second, we grouped questions about anxiety into three categories; given the large sample size, we thought this

would be the most meaningful way to interpret the data. Third, the limitations of self-reporting cannot be overlooked when trying to evaluate the level of anxiety. We hope that our discussion of the unconscious considerations was an attempt to be mindful of this limitation. On the other hand, the strength of the study is that we had surveyed a large number of HCWs from all the 13 regions in Saudi Arabia, from all different fields to be representative. Also, the timing of the study was appropriate to assess the anxiety associated with COVID-19, where the number of cases in the country was high.

We suggest that further research on anxiety among HCWs in the COVID-19 pandemic include variables that were not included in our survey: level of tolerance of uncertainty; income level; beliefs about the mortality rate of COVID-19 and factors related to mortality rate, such as trust of the medical services in one's community to treat COVID-19 (intensive care unit-bed capacity, physician competency, advanced medical resources, and other variables).

Since we have identified the high risk groups that are more likely to develop anxiety during the COVID-19 pandemic, we recommend that decision maker in healthcare institutes to be proactive and target those groups with preventative measures to avoid high level anxiety in their very precious assets in fighting the pandemic. Emphasis on having a well-written outbreak management plan, effective psychological support, adequate and timely communication may help in reducing the likelihood of a stress

## Conclusion

This study is the latest and largest study conducted in Saudi Arabia to evaluate the anxiety levels of HCWs during the COVID-19 pandemic. What we can conclude is that two-thirds of the HCWs who responded indicated moderate or high anxiety. Consideration should be given to providing high-risk groups more psychological support and communication. A written outbreak management plan may reduce the anxiety level among HCWs and their overall psychological wellbeing. The association of anxiety with other fac-

tors such as income level, tolerance of uncertainty, and trust in the healthcare system should be explored in future research.

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