Original Article

Prevalence of COVID-19-related anxiety among healthcare workers: A cross-sectional study

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ABSTRACT

Introduction: COVID-19 was labeled as a pandemic in March 2020. Healthcare workers (HCW) are confronting great mental stressors in coping with the crisis. In Saudi Arabia, research on the psychological effect of COVID-19 on HCW is lacking. **Aim:** To evaluate COVID-19 psychological impact on HCW and determine anxiety predictors to identify high-risk individuals. **Materials and Methods:** A descriptive cross-sectional study was conducted on HCW in First Health Cluster Institutes in Eastern Province. An English self-administered questionnaire was adopted from similar research done in China. The original questionnaires were modified to meet the objectives of our study and suit Saudi sociodemographic differences. Generalized anxiety disorder-7 scale was incorporated to be the main tool for assessing the psychological impact. **Results:** One-third of HCW were classified as having anxiety disorder. In univariate analyses, the age group in years ($P = 0.026$), gender ($P = 0.001$), nationality ($P = 0.033$), and living with family ($P = 0.007$) significantly influenced anxiety disorder. However, in the multivariate regression model, gender ($P = 0.004$), living with family ($P = 0.021$), family history of COVID-19 ($P = 0.022$), and been suspected or confirmed with COVID-19 infection ($P = 0.018$) remained statistically significant when compared to anxiety disorder. **Conclusion:** During early COVID-19 pandemic, anxiety disorder among HCW was noticeable. Being a female, living with family members, and having a family history of COVID-19 increased the risk for anxiety disorder.

Keywords: Anxiety disorder, COVID-19, healthcare workers, mental disorder, Saudi Arabia

Background

An outbreak is defined by the World Health Organization (WHO) as the occurrence of disease cases in excess of normal expectancy.[1] The outbreak of a new coronavirus disease (COVID-19) was declared as Public Health Emergency by WHO January 2020 which is labeled as a pandemic in March 2020.[1] Pandemic is the worldwide spread of a new disease.[1] Coronaviruses are a large family of viruses that cause common cold, pneumonia, and severe acute respiratory syndrome (SARS).[1] Coronaviruses outbreak was initially identified in 2003 causing SARS-CoV1.[1] The rapid escalate of COVID-19 puts strong emotions and stress on populations particularly healthcare workers (HCW) who are confronting great physical as well as mental stressors in coping with this challenging crisis.[2] Proactively, the Saudi Ministry of Health (MOH) developed and released a visual triage scoring system to alert HCW and early identify patients with acute respiratory illness.[3] Different factors were identified in decreasing the emotional burden especially social support, clear communication and distribution of tasks, flexible working hours, and the utilization of psychosocial and psychological help without stigmatization.[4] COVID-19 outbreak expected to impact the mental health of local medical and nursing staff in china initially since the virus was first identified there.[5]

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Moreover, frontline HCW from four hospitals in Wuhan were surveyed during the COVID-19 outbreak and reported elevated depression (12.7%) and anxiety (20.1%). Symptoms associated with greater perceived stress, poor sleep quality, and absence of perceived psychological preparedness were linked to higher risk for depression and anxiety.[6] Kang *et al.* tested the psychological burden on HCW showed that 36.9% had subthreshold mental health disturbances, 34.4% had mild disturbances, 22.4% had moderate disturbances, and 6.2% had a severe disturbance in the immediate wake of the viral epidemic.[5] Another study done in Wuhan, which was a cross-sectional study showed 29.8%, 13.5%, and 24.1% of HCW having stress, depression, and anxiety, respectively.[7] Comparing these results to the previous 2003 SARS outbreak, psychological distress continued to even 1 year after the outbreak.[8] The long-term psychological consequences of infectious diseases should not be overlooked.[8] Another study showed that Medical staff in the period of Middle East respiratory syndrome, a different subtype of the coronavirus, had a high risk for post-traumatic stress disorder symptoms even after time had elapsed.[9] Different factors were identified to contribute to the psychological burden including those who have more than 10 years of working, concomitant chronic diseases, history of mental disorders, and family members or relatives confirmed or suspected COVID-19 are susceptible to stress, depression, and anxiety.[7] Those findings emphasize the importance of supporting HCW and preparing proper mental health interventions.[5,7-9] To date in Saudi Arabia, research on the psychological effect of COVID-19 on HCW during the outbreak is lacking. We aim to evaluate the immediate early psychological impact on HCW working under the umbrella of the First Health Cluster institutes and determine the predictors of acute anxiety to identify high-risk individuals. This is the first study of its kind in the Eastern Providence of Saudi Arabia and one of the few studies which provide information regarding the mental status of HCW regarding the COVID-19 pandemic. And since primary care is the first-line defender of the wellbeing of all community individuals including HCW biopsychosocially, we also aim to be prepared proactively to support those who are in need by providing the ultimate care and protection.

Materials and Methods

A descriptive cross-sectional study was conducted on HCW working under the umbrella of the E1-First Health cluster, Eastern Province, Saudi Arabia ($N = 441$). An English self-administered questionnaire is adopted from similar research.[7] Permission is obtained from the main author by email. The original questionnaires are modified to meet the objectives of our study and suit Saudi sociodemographic differences. Generalized anxiety disorder-7 (GAD-7) scale is incorporated to be the main tool for assessing the psychological impact. The questionnaire includes 34 items divided into four sections: A, B, C, and D. Section A includes fourteen items for sociodemographic information. Section B includes two items asking about the history of COVID-19. Section C includes ten items aimed to assess the status of the HCW in dealing with COVID-19. The final section D, including items

28–34, is aimed to measure GAD-7 score. GAD-7 scale was used to identify anxiety disorders. A cutoff score ≥8 is recommended to identify clinically important anxiety symptoms, with adequate specificity (82.0%) and sensitivity (77.0%).[10] The questionnaire and invitation to participate letter were independently validated and approved by three consultants along with the pilot study performed earlier.

Ethical approval from the Institutional Review Board (IRB)/Ethical committee was obtained prior to data collection. The Collaborative Institutional Training Initiative (CITI) was also acquired by all investigators. Approval obtained from Institute Review Board on 13/04/2020.

HCW database (emails/mobile numbers) was obtained from the E1-First Health cluster. Subjects were recruited by sending an electronic survey including an invitation to participate letter via email or WhatsApp mobile application. A sample size of 380 was calculated as adequate to detect a statistically significant result with 95% levels of confidence and a 0.5 margin of error. We increased the sample by 20% to cover the nonresponse rate giving an overall sample size of 456. The participants were all clinicians working in First Health Cluster Institutes. The exclusion criteria were as follows: non-English speaking HCW, non-Eastern Province HCW, working in institutes other than First Health Cluster, and currently being admitted with COVID-19. Ethical approval from the Institutional Review Board/Ethics Committee was obtained and an invitation to participate was provided by all study participants. Collaborative Institutional Training Initiative and the National Institutes of Health certifications were also acquired. All agreed to participate after being given information regarding the purpose of the study and confidentiality assurance. All participants had the right to object to the study and withdraw at any time. All gathered information was kept confidential in a password protected laptop analyzed by a single investigator to ensure confidentiality. The variables studied included the following: Age, sex, nationality, education, years of experience, occupation, years of working, and current and past medical history. The dependent variables were GAD-7 scores, perception of threats of COVID-19, and effects of psychological protective measures. A pilot study was conducted in Erada Mental Health Complex. In the pilot study, we assessed 45 HCW with similar characteristics to those in the larger study to determine whether changes were required to the questionnaire. The results indicated that the questionnaires were easily understood and comprehensive. As such, no changes were needed. In the main study, data were coded, checked for completeness, sorted, and verified to eliminate inconsistencies or outliers. Data were computerized, processed, and analyzed by the principal investigator with the help of a biostatistician, using the statistical package for social sciences, version 21 (SPSS, Armonk, NY:IBM Corp, USA). Cronbach's alpha was used to assess reliability; a value of 80.9% indicated high reliability. Descriptive statistics were presented as counts, proportions (%) mean, and standard deviation whenever appropriate. The association between anxiety disorder among the basic demographic and

the history of COVID19 infection had been conducted using Chi-square test. A *P* value of < 0.05 was considered statistically significant. Multivariate regression analyses were also conducted to determine the independent factors associated with an anxiety disorder.

Results

We distributed 456 questionnaires among the targeted HCW, and 441 were received, giving an overall response rate of 96.7%. Table 1 presents the sociodemographic characteristics of 441 participants. The age range was from 25 to 65 years with nearly all (85.9%) were in the younger age group (25–45 years). Females (72.8%) were predominantly higher than males (27.2%) with most of them were Saudis (80.7%) and almost all had been married (81%). Furthermore, half of them were working in Dammam (50.6%), specifically in King Fahad Specialist Hospital- Dammam (36.7%). With regards to the education of participants, more than half of them (54.2%) had a bachelor's degree, followed by a Ph.D. or equivalent (26.5%). Concerning occupational status, approximately 57% of them were doctors and nurses (29.7%). We further observed that about 35% of them had more than 10 years of working experience with approximately 55% currently working at outpatient departments. Likewise, nearly all of them (87.1%) were living with their family with about 3 quarters (72.3%) having children. Table 2 shows the history of COVID19 infection along with past medical history and physical activity of participants. It was found that nearly all (85.9%) were in good health while 40.6% of them were engaged in physical activity. We also observed 15.2% of participants had a family history, relative, or close friend of COVID19. The prevalence of suspected or confirmed COVID19 was 15.4% Table 3. Figure 1 shows the prevalence of anxiety of HCW based on GAD-7 criteria. The mean anxiety score was 6.3 (SD 5.53) with one-third (33.3%) were classified as having anxiety disorder while the remaining two-thirds (66.7%) were having no symptoms of anxiety. Figure 2 depicts the level of anxiety using GAD-7 criteria. It was observed that mild anxiety was found among 27% of HCW, followed by moderate with 13.2% and severe anxiety with 7.9% Table 4. When measuring the association between anxiety disorder and the sociodemographic characteristics of participants, it was found that older ages (46–65 years) and non-Saudis ($\chi^2 = 4.554$; $P = 0.033$) were significantly less of having anxiety disorder ($\chi^2 = 4.964$; $P = 0.026$), whereas females ($\chi^2 = 10.098$; $P = 0.001$) and those living with their family ($\chi^2 = 7.344$; $P = 0.007$) were significantly more of having an anxiety disorder. Other variables such as marital status, work area, work institute, educational level, occupational status, monthly income, years of experience, current workplace, and having children were not statistically associated with an anxiety disorder (All $P > 0.05$). When conducting multivariate regression analysis to predict the effect of anxiety disorder from the certain characteristics of participants, we have known that, compared to males, the risk of having anxiety disorder in females is two times higher [Adjusted odds ratio (AOR) = 2.102; confidence interval (CI) = 1.272–3.474; $P = 0.004$]. It was also observed

that the risk of having anxiety disorder for those living with family is likely to increase by two times compared to those living alone (AOR = 2.585; CI = 1.152–5.800; $P = 0.021$) while the likelihood ratio of having anxiety disorder for those participants with a family history of COVID-19 could also be likely to increase

Table 1: Socio-Demographic characteristics of participants (*n*=441)	
Study variables	***n* (%)**
Age group	
25 - 45 years	379 (85.9%)
46 - 65 years	62 (14.1%)
Gender	
Male	120 (27.2%)
Female	321 (72.8%)
Nationality	
Saudi	356 (80.7%)
Non-Saudi	85 (19.3%)
Marital status	
Never been married	84 (19.0%)
Been married	357 (81.0%)
Work area	
Dammam	223 (50.6%)
Al Khobar	37 (08.4%)
Qatif	181 (41.0%)
Work institute	
KFSH-D	162 (36.7%)
Dammam Central Hospital	48 (10.9%)
Qatif Central Hospital	106 (24.0%)
Primary Healthcare	125 (28.3%)
Educational level	
Diploma	65 (14.7%)
Bachelor degree	239 (54.2%)
Master degree	20 (04.5%)
Ph.D. or equivalent	117 (26.5%)
Occupational status	
Doctor	251 (56.9%)
Nurse	131 (29.7%)
Allied health practitioner	59 (13.4%)
Monthly income (SAR)	
<15,000	151 (34.2%)
15,001 - 20,000	137 (31.1%)
>20,000	153 (34.7%)
Years of experience	
≤6 years	147 (33.3%)
7 - 10 years	140 (31.7%)
>10 years	154 (34.9%)
Current workplace	
Non-isolation ward	110 (24.9%)
Isolation ward	59 (13.4%)
Visual triage	31 (07.0%)
OPD	241 (54.6%)
Living with family	
Yes	384 (87.1%)
No	57 (12.9%)
Having children	
Yes	319 (72.3%)
No	122 (27.7%)

KFSH-D=King Fahad Specialist Hospital, Dammam.

by almost two times compared to its opposite group (AOR = 19; CI = 1.098–3.358; *P* = 0.022). On the other hand, the age group in years and nationality did not differ significantly when compared to anxiety disorder after adjusting to regression model [Table 5].

Discussion

This study investigated the psychological impact of the viral outbreak, COVID-19 among HCW. This is the first study in Saudi Arabia that examined the mental condition of HCW during COVID-19 infection. We also assessed factors associated with anxiety symptoms. In this study, the prevalence of HCW with an anxiety disorder was 33.3% (GAD-7 mean score 6.3 ± 5.53 SD), this includes mild (27%), moderate (13.2%), and severe anxiety (7.9%) which affected the mental condition of our HCW in the wake of epidemic viral infection. This result is lower than the study of Lai *et al.*[2] They found that among 1257 HCW, 44.6% of them were detected to have anxiety symptoms. Similarly, during the SARS outbreak, they reported that anxiety symptoms were moderate-to-severe in 36.7% of the participants and extremely severe in 14.4% of the participants which was also higher prevalence rate than our report.[8] The Saudi Ministry of Health (MOH) in cooperation with other ministries and government entities has put tremendous efforts in controlling COVID-19 pandemic proactively.[11] Figure 3, adopted from Saudi Health Council, shows the early precautions and management plans which the government employed to minimize infection spread since first cases were detected.[12] These regulations have contributed positively to the community and HCW by giving a sense of confidence and security. This would explain the reduced level of anxiety among HCW in this study.[11] Conversely, the prevalence of anxiety in our study was higher than the two other studies conducted in China which reported prevalence rates of anxiety with 20.1% and 24.1%, respectively.[6,7] The lowest prevalence rate of anxiety was reported by Liu *et al.*,[13] which was surveyed among medical workers in Shenzhen, China. They reported that anxiety was found among 12.5% comprising 10.35% of mild anxiety, 1.36% of moderate anxiety, and 0.78% of severe anxiety. On the other hand, our results were consistent with the study of Kang *et al.*,[5] where they reported that 36.9% had subthreshold mental health disturbances, 34.4% had mild disturbances, 22.4% had moderate disturbances, and 6.2% had a severe disturbance in the immediate wake of the viral epidemic (COVID-19). Different studies conducted in China had provided several factors associated with psychological disorders.[2,6-7,13] Since most of the reports were surveyed among medical frontlines, it was predicted that many factors were attributed to mental disorders. For instance, Lai *et al.*[2] reported that frontline HCW engaged in the direct diagnosis, treatment, and care of patients with COVID-19 were associated with a higher risk of symptoms of depression, anxiety, insomnia, and distress. Following multivariable logistics regression analysis, they found that being a woman and having an intermediate professional title was associated with severe symptoms of depression, anxiety, and distress. Another published study in China[6] indicated that after adjusting for age, gender, and residence of origin, logistics regression results showed that a lack of perceived psychological preparedness, perceived self-efficacy to help the patients, and family support; greater perceived stress; or having poor sleep quality were associated with elevated anxiety

Table 2: History of COVID-19 Infection and other basic characteristics of participants (*n*=441)

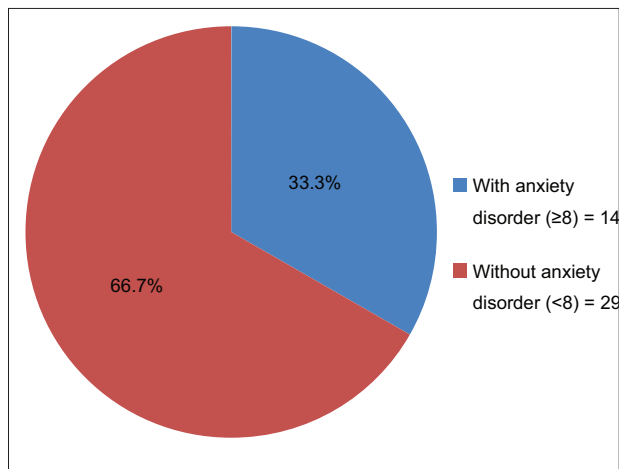| Study variables	*n* (%)
Past medical history	
In good health	379 (85.9%)
With chronic non-communicable disease	54 (12.2%)
With a history of mental disorder	08 (01.8%)
Physical activity	
Yes	179 (40.6%)
No	262 (59.4%)
Family history, relatives or close friends of COVID19	
Yes	67 (15.2%)
No	374 (84.8%)
Have you been suspected or confirmed COVID19	
Yes	68 (15.4%)
No	373 (84.6%)

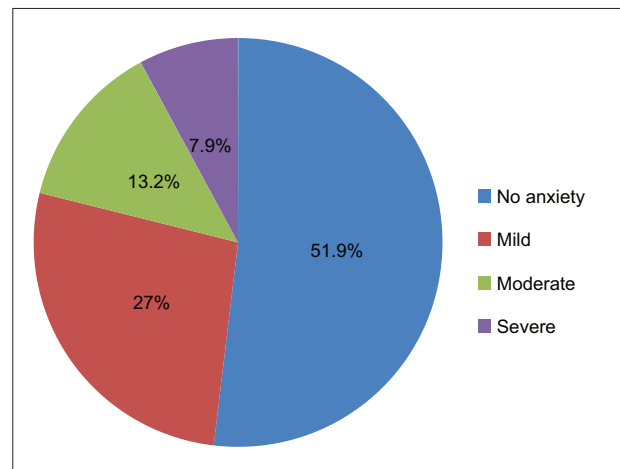**Figure 1:** Prevalence of anxiety based on GAD-7 criteria

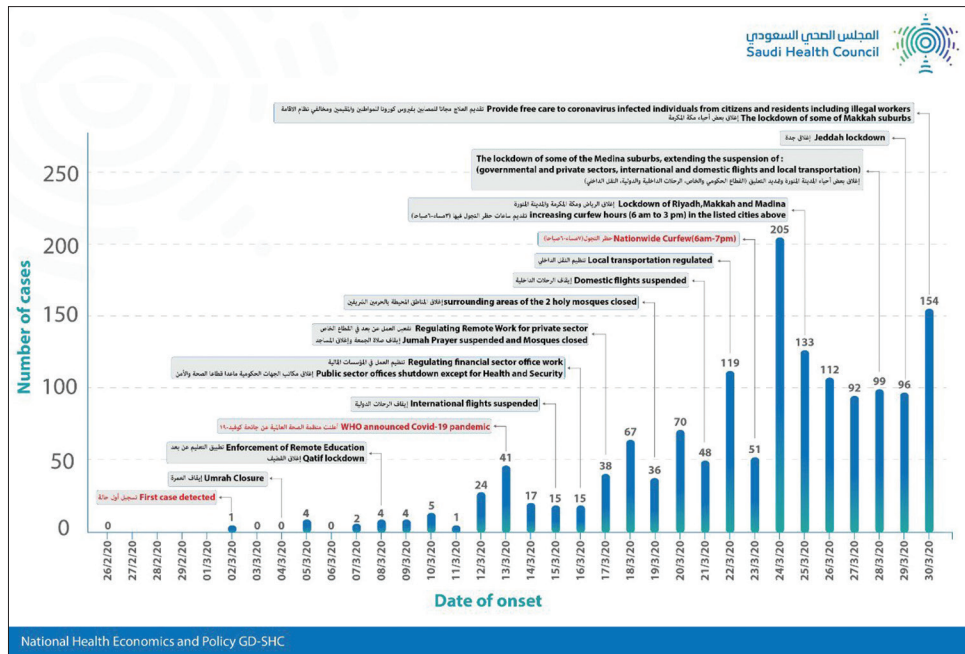**Figure 2:** Level of anxiety based on GAD-7 criteria

Figure 3: Confirmed cases of COVID-19 in Saudi Arabia and Responses adopted from Saudi Health Council

Table 3: Dealing with COVID-19 in the past 2 weeks (*n*=441)			
Statement	Agree *n* (%)	Disagree *n* (%)	Uncertain *n* (%)
Feeling exposed to COVID-19	105 (23.8%)	161 (36.5%)	175 (39.7%)
Thought of resigning because of the COVID-19 outbreak	54 (12.2%)	332 (75.3%)	55 (12.5%)
Worried about life-threatening complications once infected	275 (62.4%)	120 (27.2%)	46 (10.4%)
Worried about oneself or family members being infected by COVID-19	385 (87.3%)	36 (08.2%)	20 (04.5%)
Having avoided by family members or friends because of contact from work	208 (47.2%)	175 (39.7%)	58 (13.2%)
Having joined or contacted any psychological support group (outside hospital) dealing with COVID-19	25 (05.7%)	406 (92.1%)	10 (02.3%)
Received any psychological care provided by the hospital and department administrators	32 (07.3%)	394 (89.3%)	15 (03.4%)
Satisfaction with the full coverage of all departments with protective measures for nosocomial infection	189 (42.9%)	159 (36.1%)	93 (21.1%)
Satisfaction with your work shift arrangement	283 (64.2%)	107 (24.3%)	51 (11.6%)
Satisfaction with the logistical support and accommodations arranged by the hospital	193 (43.8%)	142 (32.2%)	106 (24.0%)

symptoms. Furthermore, they also documented having family or friends infected with the virus were also associated with elevated anxiety symptoms. Some of the factors associated with anxiety disorder mentioned above were consistent from our study. For example, in our study based on multivariate regression analysis, we found that females had a higher risk of having anxiety disorder than males and living with family members was also predicted to have an increased rate of anxiety disorder among HCW. Likewise, during the Ebola outbreak, health care professionals who experienced social isolation suggested that their spouses, children, and other relatives had infection-related concerns. Their study further revealed that half of the participants who did not have direct patient contact reported feeling a need for psychological preparation.[14] A study of *Zhu et al.*[7] revealed that living with family members and worried about oneself or family members being infected by COVID-19 were factors

contributing to increased anxiety symptoms. These findings were consistent with our report as living with family members and having family members, relatives, or friends with COVID-19 infection were also the factors that increased level in anxiety. In dealing with COVID-19, the psychological impact on HCW prompted them to contemplate their future. However, in our study, even though COVID-19 infection is worrisome and is life-threatening, the majority of HCW were still satisfied with their shift arrangement and most of them never thought of resigning and let alone consequences decided for themselves. We also noticed that most of HCW have not involved or never received psychological support in regards to COVID-19 which is needed to address in public health measures during this epidemic course. During Ebola virus outbreak,[14] they reported no staff member refused to participate in the treatment of the Ebola patient, which underlines the high level of motivation within the

Table 4: Association between anxiety and the socio-demographic characteristics of participants (*n*=441)				
Factor	Anxiety Disorder		X^2	$P^§$
	With anxiety ≥8 *n* (%)	Without Anxiety <8 *n* (%)		
Age group				
25 - 45 years	134 (91.2%)	245 (83.3%)	4.964	0.026 **
46 - 65 years	13 (08.8%)	49 (16.7%)		
Gender				
Male	26 (17.7%)	94 (32.0%)	10.098	0.001 **
Female	121 (82.3%)	200 (68.0%)		
Nationality				
Saudi	127 (86.4%)	229 (77.9%)	4.554	0.033 **
Non-Saudi	20 (13.6%)	65 (22.1%)		
Marital status				
Never been married	30 (20.4%)	54 (18.4%)	0.265	0.607
Been married	117 (79.6%)	240 (81.6%)		
Work area				
Inside Dammam	78 (53.1%)	145 (49.3%)	0.549	0.459
Outside Dammam	69 (46.9%)	149 (50.7%)		
Work institute				
Non KFSH-D	97 (66.0%)	182 (61.9%)	0.703	0.402
KFSH-D	50 (34.0%)	112 (38.1%)		
Educational level				
Bachelor degree or diploma	105 (71.4%)	199 (67.7%)	0.641	0.423
PhD or master degree	42 (28.6%)	95 (32.3%)		
Occupational status				
Non-doctor	64 (43.5%)	126 (42.9%)	0.018	0.892
Doctor	83 (56.5%)	168 (57.1%)		
Monthly income (SAR)				
<15,000	52 (35.4%)	99 (33.7%)		
15,001 - 20,000	43 (29.3%)	94 (32.0%)	0.346	0.841
>20,000	52 (35.4%)	101 (34.4%)		
Years of experience				
≤6 years	44 (29.9%)	103 (35.0%)		
7 - 10 years	55 (37.4%)	85 (28.9%)	3.322	0.190
>10 years	48 (32.7%)	106 (36.1%)		
Current workplace				
Non-isolation ward	32 (21.8%)	78 (26.5%)		
Isolation ward	17 (11.6%)	42 (14.3%)		
Visual triage	12 (08.2%)	19 (06.5%)	2.436	0.487
OPD	86 (58.5%)	155 (52.7%)		
Living with family				
Yes	137 (93.2%)	247 (84.0%)	7.344	0.007 **
No	10 (06.8%)	47 (16.0%)		
Having children				
Yes	109 (74.1%)	210 (71.4%)	0.363	0.547
No	38 (25.9%)	84 (28.6%)		

KFSH-D=King Fahad Specialist Hospital, Dammam. § *P*-value has been calculated using Chi-Square test. ** Significant at *p*<0.05 level.

team and that almost all health care professionals (97% of those with direct patient contact, 93% of those without direct patient contact) believed that the health care facilities of the hospital were safe. These reports indicated that healthcare professionals had a better outlook in dealing with the Ebola outbreak and this did not seem to coincide with our reports. Compared to this study, a similar one done by Temsah *et al.*, 2020 who assessed the psychological effect of COVID-19 on HCW before any cases were reported in Saudi Arabia, found out that 41.1% were worried about the pandemic.[15]

Conclusion

Although this study was done in only one area in Saudi Arabia during early COVID-19 outbreak with a relatively small sample size, it showed that anxiety disorder among HCW was noticeable. Being a female, living with family members, and having a family history of COVID-19 infection increased the risk of anxiety disorder. It is important to address the gaps in the psychological condition of HCW during an outbreak. Government and health care institutions should design a proactive approach by providing

Table 5: Multivariate regression analysis to determine the factors associated with an anxiety disorder (*n*=441)

Factor	AOR	95% CI	*P*
Age group			
25 - 45 years	Ref		
46 - 65 years	0.539	0.269 - 1.079	0.081
Gender			
Male	Ref		
Female	2.102	1.272 - 3.474	0.004 **
Nationality			
Saudi	Ref		
Non-Saudi	0.966	0.502 - 1.861	0.918
Living with family			
Yes	2.585	1.152 - 5.800	0.021 **
No	Ref		
Family history of COVID19			
Yes	1.920	1.098 - 3.358	0.022 **
No	Ref		

AOR - Adjusted Odds Ratio; CI - Confidence Interval. ** Significant at $p<0.05$ level.

psychological and counseling services to prevent the increasing rate of anxiety disorder among HCW. Safeguarding our HCW against the COVID-19 pandemic is an integral part of public health measures as they are the centerpiece in combating the increasing rate of COVID-19 cases. We also recommend that officials ensure positive attitudes in the workplace and stoppage of disease transmission among HCW by adopting strict protective measures to alleviate their fear, protect their family members, and drive them through the pandemic. Appreciated recognitions of HCW efforts by hospital management and expected similar acknowledgment would persuade them to work with less anxiety.

Key Massages: To date in Saudi Arabia, research on the psychological effect of COVID-19 on HCW during COVID-19 outbreak is lacking. We aim to evaluate the immediate early psychological impact on HCW working under the umbrella of the First Health Cluster institutes and determine the predictors of acute anxiety to identify high-risk individuals. This is the first study of its kind in the Eastern Providence of Saudi Arabia and one of the few studies which provide information regarding the mental status of HCW regarding the COVID-19 pandemic. And since primary care is the first-line defender of the wellbeing of all community individuals including HCW biopsychosocially, we also aim to be prepared proactively to support those who are in need by providing the ultimate care and protection.

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Conflicts of interest

There are no conflicts of interest.

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