

## ORIGINAL ARTICLE

# Psychological impact of COVID-19 on Healthcare Workers in King Hamad University Hospital, Kingdom of Bahrain

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### Abstract

**Background:** The COVID-19 pandemic is a global health crisis with a likely long-term psychological impact on healthcare workers (HCWs). As the pandemic moves towards endemic status, little knowledge exists on how it has affected HCWs in the Kingdom of Bahrain. This study aims to evaluate the psychological impact and related factors of HCWs during the COVID-19 pandemic. Factors were assessed at two time periods: 1- July 2020 (T1: 6 months after the pandemic started in Bahrain) and 2- 6-month follow-up during January 2021 (T2: 12 months).

**Methods:** An online cross-sectional survey using standardized questionnaires; Impact of Event Scale-Revised (IES-R), the Beck Anxiety Inventory (BAI), and factors including lifestyle, exposure to COVID-19, and knowledge of the centre's psychological support services was circulated during both the time periods.

**Results:** Based on a sample size of 366 (T1) and 537 (T2) HCWs, mild/positive PTSD prevalence increased from 18.9% (T1) to 19.6 % (T2), but anxiety decreased from 31.1% (T1) to 27.4% (T2). Sleep-related disturbances significantly decreased from T1 to T2 (32.5 % vs 24.8%,  $p = 0.013$ ). Although the frequency of HCWs with psychological distress and anxiety did not change significantly over time, there was a decrease in severity of both psychological distress ( $p=0.06$ ) and anxiety ( $p=0.005$ ). HCWs (75%) who were aware of available psychological support services also had lower IES-R and BAI scores.

**Conclusion:** COVID-19 has caused psychological distress and anxiety to HCWs, but rates were lower compared to other studies. Further development of COVID-19 leadership strategies incorporating interventions focused on psychological support for HCWs is needed.

**Keywords:** COVID-19, Trauma, Mental health, Anxiety, Psychological impact, Post-traumatic stress disorder

### Introduction

On March 12, 2020, the World Health Organization (WHO) declared the Coronavirus Disease (COVID-19) outbreak a pandemic. As of January

2, 2022, WHO reports that there have been approximately 289 million confirmed cases and 5.44 million COVID-19-related deaths globally.<sup>1</sup> WHO guidance's regarding mental health and

COVID-19 state that the main psychological impact to date involved elevated rates of stress or anxiety. As new measures and impacts are introduced to reduce the transmission of COVID-19, especially the effects of quarantine on usual routines (such as social distancing and working remotely), levels of isolation may lead to reduced levels of social support, one of the main coping mechanisms of stress, anxiety, and depression.<sup>2,3</sup> Importantly, the widespread increase in mental health issues has become an alarming concern.<sup>4-6</sup> Substance abuse and self-harm or suicidal behavior have also risen.<sup>6,7</sup> One group that is particularly at high-risk to acquire this infection and thus, more vulnerable to the psychological impact of COVID-19 are healthcare workers (HCWs).<sup>8-10</sup>

The psychological impact of COVID-19 has been measured amongst frontline workers, HCWs<sup>1</sup>, and specific medical specialties mainly through self-administered questionnaires across Asia, Europe, and North America.<sup>6-21</sup> So far, there is limited evidence on this topic in the Middle East with only a few studies conducted.<sup>12, 22-27</sup>

Globally, prevalence rates of stress (27-71%) and anxiety (23-51%) have been the highest and most reported mental health symptoms among HCWs during the COVID-19 pandemic.<sup>6, 9, 10, 28</sup> Regional studies have reported similarly high rates of stress, anxiety, and depressive disorder. They also highlighted that female, young, non-married HCWs, particularly nurses, were more likely to report these symptoms during the COVID-19 outbreak.<sup>12,22, 29, 30</sup>

Similar studies conducted in the Kingdom of Bahrain during the pandemic also corroborated these findings. Results demonstrated that 20-30% of participants reported symptoms of depression and stress, whereas approximately 18% showed signs of anxiety.<sup>31,32</sup> In both studies, females were shown to have a greater prevalence in symptoms of depression, stress, and anxiety. Another Bahrain-based study found that 60% of HCWs had poor sleep quality, which can contribute to moderate-severe stress.<sup>32</sup> These studies used several validated psychological assessments to measure various psychological well-being components in HCWs. In contrast, the

current study utilized the Impact of Events Scale-Revised (IES-R), to assess psychological distress by measuring post-traumatic stress disorder (PTSD) prevalence. This has previously not been explored in HCWs in Bahrain in the context of a specific traumatic event (COVID-19 pandemic).

Six months after the first COVID-19 case was found in the Kingdom of Bahrain on February 21st, 2020, the Kingdom reported 11,804 related cases and 68 related deaths.<sup>33</sup> In the span of four months, the number of positive cases exponentially rose and was reported to be 83,456 on November 9, 2020, representing approximately 6.3% of the population.<sup>34</sup> This study aimed to assess the psychological impact of COVID-19 on HCWs at two time periods (T1=2020; T2=2021) during the pandemic. We hypothesized that psychological distress (assessed as the prevalence of PTSD) and anxiety would decrease over time due to increased awareness and psychological support services provided by the hospital.

To the best of our knowledge, this was the first study to evaluate the psychological impact (assessed as the prevalence of PTSD) and anxiety levels of HCWs as a direct result of the COVID-19 pandemic in Bahrain, by utilizing the IES-R and Beck Anxiety Inventory (BAI). The objectives were threefold; to assess the prevalence and severity of psychological distress and anxiety, in relation to the demographic and associated risk factors among HCWs at two time periods (T1 and T2); to assess their knowledge of available psychological support services at the hospital; and to Compare whether psychological distress, anxiety, and knowledge of psychological services changes from T1 to T2.

## Methods

### *Study Design & Setting*

In this cross-sectional quantitative study, we developed an online survey using the platform Survey Monkey<sup>TM</sup> to collect our data. Data collection was conducted from July 29<sup>th</sup> to August 31<sup>st</sup>, 2020 (T1) and from January 29<sup>th</sup> to February 28<sup>th</sup>, 2021 (T2). The study was conducted in King Hamad University Hospital (KHUH), one of the three major governmental hospitals in the Kingdom

of Bahrain. Ethical approval from the Institutional Review Board at KHUH was acquired prior to study initiation.

### ***Participant Recruitment and Sample Size***

Participants were selected through convenience sampling, where the survey link was sent to all KHUH staff via email providing an opportunity for all who fit the inclusion criteria to participate. The email specified that only physicians, nurses, allied healthcare, and administrative staff could participate. The study categorized participants as HCW if they held a position as medical staff (nurses, doctors, technicians, pharmacists), and non-medical staff (clerks, secretaries).<sup>32</sup>

The target sample size was estimated based on the WHO recommendations for a prevalence study.<sup>35</sup> The required sample size was 306 participants from the study population (CI: 95%, SD: 0.5, marginal error = 5%). During the initial assessment (T1), a sample of 580 HCWs were recruited (of which 406 completed the survey). Out of the 406, 17 were excluded because they stated that they were previously diagnosed with a mental illness prior to the COVID-19 outbreak, bringing the sample size for data analysis to 366 HCWs. During the follow-up assessment (T2), a sample of 685 HCWs were recruited (of which 555 completed the survey). Out of the 555, 18 were excluded for the same reason above. The final sample size at T2 was 537 HCWs (Figure 1).

KHUH does not admit or manage COVID-19 positive cases as per the guidelines of the Bahrain National Taskforce for Combating the Coronavirus (COVID-19). However, screening tents are provided outside the hospital, which are covered by Emergency Department physicians and nurses on rotation. Therefore, they would be categorized as frontline workers and were included in this study. The exclusion criteria were non-healthcare workers and HCWs who had been diagnosed with a mental illness prior to the COVID-19 outbreak. This exclusion criterion was included to ensure that any psychological impact incurred was related to COVID-19 only and not due to any previous mental illness.

## ***Measures***

### ***Psychological Impact***

The psychological impact was measured by the Impact of Event Scale-Revised (IES-R), a highly reliable 22-item self-report scale that assesses subjective distress caused by traumatic events.<sup>36,37</sup> The latest IES-R includes 3 subscales: 1- intrusion (8 items), e.g., repeated thoughts about the trauma; 2- avoidance (8 items), assessing effortful avoidance of situations that serve as reminders of the trauma and 3- psychological hyperarousal (6 items), which indicates symptoms of PTSD e.g. irritability, anger, trouble falling asleep, and others.<sup>38</sup>

Respondents are asked to identify a specific stressful life event (in this study, the COVID-19 outbreak) and then indicate how much they were distressed or bothered during the past seven days by each “difficulty” listed. Response options are based on a 5-point Likert Scale from ‘Not at all’ (0) to ‘Extremely’ (4). Total scores range from 0 to 88. Subscale scores ranged from 0 to 32 for the intrusion and avoidance subscales and 0 to 24 for the hyperarousal subscale. A cut-off score of 33 and above indicated severe psychological distress and probable preliminary diagnosis of PTSD (mild/positive).<sup>16,39</sup>

According to a recent meta-analysis, the IES-R is the most common standardized instrument to measure symptoms of distress among HCWs during emerging virus outbreaks, including COVID-19.<sup>6,10,13,16,40</sup> Recent studies yielded a high Cronbach’s alpha coefficient of 0.96.<sup>13,41</sup> In this study, we had a similar high internal consistency for the total scale and three subscales ( $\alpha=0.85$  to  $\alpha=0.94$ ).

### ***Anxiety***

The Beck Anxiety Inventory (BAI) was used to measure clinical anxiety.<sup>38</sup> The BAI consists of 21 items, each of which is rated by the participant on a 4-point Likert Scale from ‘Not at all’ (0) to ‘Severely, it bothered me a lot’.<sup>3</sup> The possible total score ranges from 0 to 63. Four categories of anxiety (minimal, mild, moderate, and severe) were identified based on the current literature examining anxiety (using the BAI) among HCWs during COVID-19 or a similar trauma for relevant

comparison. Cut-off scores were: 0-7 indicate minimal anxiety, 8-15 indicate mild anxiety, 16-25 indicate moderate anxiety, and 26-63 indicate severe anxiety.<sup>42</sup> The BAI has been used to look at the psychosocial impact of the SARS epidemic on Chinese health professionals<sup>41</sup> and frontline HCWs during the COVID-19 outbreak in Wuhan.<sup>11</sup> This tool has shown high internal consistency ( $\alpha=0.91$ ) and adequate test-retest reliability (0.65).<sup>42</sup> In this study, the BAI had a high and similar internal consistency ( $\alpha=0.94$ ).

#### *Demographic, Lifestyle, and COVID-19 related Variables*

There were 11 items considered in demographics, lifestyle, and the COVID-19 pandemic. The demographic variables collected in this study included: age, gender, marital status, occupation, and educational level. Variables related to lifestyle habits included: history of chronic illness (Yes/No), smoker (Yes/No), and sleep disturbances (Yes/No). Sleep disturbances were defined as: difficulty falling asleep, early awakening, affected sleep pattern, and/or tiredness during the daytime. COVID-19 related variables included: stayed in quarantine (Yes/No), how many days (if response to earlier item was yes), and whether they were infected with COVID-19 (Yes/No).

These variables were identified in literature as having a significant effect on mental health during the COVID-19 pandemic and collected to control for potential confounding variables.<sup>6, 16, 25</sup>

#### *Knowledge of KHUH Psychological Support Services*

Current KHUH psychological support services included access to a psychological support hotline available daily via telephone or in-person sessions, follow-up with staff cases who were COVID-19 positive, mental health screening, including screening for suicidality, and subsequent counseling by both the psychiatrist and psychologist.

As a secondary objective, 5 items were included to assess HCWs' knowledge and utilization of these

services. The items were: Have you ever used psychological support services before; are you aware of the KHUH psychological support services available; are you aware that KHUH offers a peer psychological support hotline; do you consider having a support line beneficial; and have you been diagnosed before with a mental illness. The response options were Yes or No.

#### **Study Protocol**

In the online survey, participants were first asked to complete an informed consent and were made aware that their responses would be confidential, anonymous, and that they could withdraw at any point if they decided to do so. The purpose, risks, and benefits of the study were listed. The main investigator's contact details were provided for any questions. No personal identifiers were obtained, and all data was kept confidential through password protection. Participants were notified to check their emails and email reminders were sent once a week to increase the response rate. No incentives or other methods of coercion were used.

The survey was composed of five sections: 1- Informed Consent; 2- Demographics, Lifestyle, and COVID-19 related variables (11 items); 3- Knowledge about KHUH psychological support services (5 items); 4- IES-R (22 items); and 5- BAI (21 items). The IES-R and BAI appeared in random sequence to enhance response rate and eliminate order bias.

#### **Data analysis**

Data was analyzed using SPSS software version 23.0 to determine quantitative and descriptive statistics. Descriptive statistics were calculated, and 95% confidence intervals are presented. The IES-R and BAI were analyzed as both continuous and dichotomous variables. Pearson correlation coefficients were estimated. Mann-Whitney tests were performed to assess significant differences in IES-R and BAI scores during T1 and T2. A  $p$ -value of  $< .05$  was considered statistically significant and  $p < .01$  was considered highly significant.

## Results

### *Participant characteristics*

Demographic characteristics are summarized in Table 1. Most participants were female in both time periods (T1: 68.6%, T2: 65.7%). The majority were between 30-39 years old (T1: 45.1%, T2: 46.7%), followed by the 20-29 age group (T1: 30.9%, T2: 26.3%). Nurses comprised the majority of HCWs

(T1: 58.7%, T2: 56.8 %) followed by physicians (T1: 19.9%, T2: 21.2%). Most participants had a bachelor's degree (T1: 68.9%, T2: 59.4%). There was an increase in quarantine cases and COVID-19 infected cases during T2 (12 months into the pandemic). The majority (T1: 75.7%, T2: 77.5%) stated that the hotline was beneficial.

**Table 1:** Demographics, COVID-19 status, and awareness of psychiatry services

Demographic Characteristics	T1: 6 months into pandemic (n=366)	T2: 12 months into pandemic (n=537)
<b>Gender</b>		
Male	115 (31.4%)	184 (34.3%)
Female	251 (68.6%)	353 (65.7%)
<b>Age Range</b>		
20-29	113 (30.9%)	141 (26.3%)
30-39	165 (45.1%)	251 (46.7%)
40-49	69 (18.9%)	115 (21.4%)
50-59	16 (4.4%)	26 (4.8%)
60-69	3 (0.8%)	4 (0.7%)
<b>Marital Status</b>		
Single	115 (31.4%)	143 (26.6%)
Married	242 (66.1%)	383 (71.3%)
Divorced/widowed	9 (2.5%)	11 (2.0%)
<b>Occupation</b>		
Physician	73 (19.9%)	114 (21.2%)
Nurse	215 (58.7%)	305 (56.8%)
Allied Health	46 (12.6%)	59 (11.0%)
Administration	32 (8.7%)	59 (11.0%)
<b>Highest Education Level</b>		
Secondary School	3 (0.8%)	5 (0.9%)
High School Diploma	24 (6.6%)	32 (6.0%)
Other (Specialty Diploma)	8 (2.2%)	3 (0.6%)
Bachelor's Degree	252 (68.9%)	319 (59.4%)
Master's Degree	66 (18.0%)	164 (30.5%)
PhD	8 (2.2%)	12 (2.2%)
(No response)	5 (1.4%)	2 (0.4%)

**Table 1 (Contd.):** Demographics, COVID-19 status, and awareness of psychiatry services

<b>Chronic illness present</b>		
Yes	36 (9.8%)	51 (9.5%)
No	330 (90.2%)	486 (90.5%)
<b>Smoker</b>		
Yes	41 (11.2%)	62 (11.5%)
No	323 (88.3%)	472 (87.9%)
<b>Sleep-related disturbances</b>		
Yes	119 (32.5%)	133 (24.8%)
No	246 (67.2%)	404 (75.2%)
<b>Stayed in quarantine</b>		
Yes	60 (16.4%)	167 (31.1%)
No	305 (83.3%)	370 (68.9%)
<b>Infected by COVID-19</b>		
Yes	12 (3.3%)	47 (8.8%)
No	349 (95.4%)	488 (90.9%)
<b>Used psychiatry services at the hospital</b>		
Yes	17 (4.6%)	21 (3.9%)
No	349 (95.4%)	516 (96.1%)
<b>Aware of the psychiatry services available</b>		
Yes	265 (72.4%)	406 (75.6%)
No	101 (27.6%)	131 (24.4%)
<b>Aware that KHUH offers a peer psychological support hotline</b>		
Yes	139 (38.0%)	232 (43.2%)
No	227 (62.0%)	305 (56.8%)
<b>Consider hotline beneficial</b>		
Yes	277 (75.7%)	416 (77.5%)
No	89 (24.3%)	121 (22.5%)

**Prevalence of psychological distress/PTSD and anxiety**

At T1, around 18.9 % of HCWs reported PTSD and the prevalence rate was almost the same (19.6%) at T2 (Table 2). Anxiety rates from T1 to T2 were

69.9% vs. 72.6% for minimal anxiety, 14.5% vs. 11.4% for mild anxiety, 10.7 % vs. 9.1% for moderate anxiety and 4.9% vs. 6.9% for severe anxiety (Table 2).

**Table 2:** Frequency distribution of PTSD and anxiety among healthcare workers at T1 and T2

	Normal (no PTSD)	Mild/positive PTSD	Minimal anxiety	Mild anxiety	Moderate anxiety	Severe anxiety
<b>6 months into pandemic (T1)</b>	297 (81.1%)	69 (18.9%)	256 (69.9%)	53 (14.5%)	39 (10.7%)	18 (4.9%)
<b>12 months into pandemic (T2)</b>	432 (80.4%)	105 (19.6%)	390 (72.6%)	61 (11.4%)	49 (9.1%)	37 (6.9%)

IES-R:  $p=0.86$  (non-significant); Post-Traumatic Stress Disorder: PTSD

BAI:  $p=0.28$  (non-significant); Minimal anxiety (BAI score of 0-7); Mild anxiety (BAI score of 8-15); Moderate anxiety (BAI score of 16-25); Severe anxiety (BAI score of 26-63).

The most severe domain for HCWs was avoidance, followed by intrusion and hyperarousal. A mean reduction of  $1.19 \pm 1.18$  was noted in the IES-R total score with a marginal level of significance ( $p=0.06$ ). There was a significant mean reduction in BAI scores of  $0.44 \pm 0.68$  ( $p=0.005$ ) (Table 3).

Sleep-related disturbances significantly decreased from T1 to T2 (32.5% vs 24.8%,  $p=0.013$ ). This may have been related to lower stress and anxiety levels at T2. Although HCW figures with PTSD and anxiety did not change over time, there was a decrease in IES-R scores (non-significant) and

anxiety ( $p=0.005$ ). Approximately 75% of the HCWs were aware of the psychiatry services at the medical centre and had lower IES-R and BAI scores. Bivariate analysis indicated a strong positive correlation between IES-R and BAI scales at both time periods (Table 4).

### Significant predictors of psychological distress/PTSD and anxiety

Logistic regression was conducted to identify the significant predictors of psychological distress/PTSD and anxiety during the COVID-19 pandemic for HCWs (see Table 5).

**Table 3:** Mean scores and standard deviations of psychological distress/PTSD (IES-R), IES-R subscales and anxiety (BAI) of healthcare workers at T1 and T2

	T1: 6 months into pandemic	T2: 12 months into pandemic	p value
<b>IES-R</b>	$19.09 \pm 17.03$	$17.89 \pm 17.79$	0.06
<b>IES-R subscales</b>			
<b>Intrusion</b>	$6.50 \pm 6.77$	$6.09 \pm 6.76$	0.17
<b>Avoidance</b>	$7.90 \pm 6.69$	$7.43 \pm 7.00$	0.12
<b>Hyperarousal</b>	$4.68 \pm 5.04$	$4.36 \pm 5.03$	0.10
<b>BAI</b>	$7.33 \pm 9.77$	$6.89 \pm 10.45$	<b>0.005</b>

**Table 4:** Correlation analysis

	T1: 6 months into pandemic (r, p)	T2: 12 months into pandemic (r, p)
Bivariate correlation IES-R* BAI	0.71, 0.000	0.67, 0.000

**Table 5:** Significant predictors of psychological distress/PTSD and anxiety for healthcare workers at T1 and T2

**T1**

<b>IES-R (Model with R<sup>2</sup> = 0.12)</b>						
Factor	Unadjusted			Adjusted		
	OR	95% CI	P value	OR	95% CI	P value
<b>Age</b>						
20-29	5.92	0.75 - 46.45	0.90			
30-39	4.33	0.55 - 33.65	0.16			
40-49	2.36	0.27 - 20.15	0.43			
>50 (Ref)						
<b>Marital status</b>						
Single	0.58	0.13 - 2.49	0.46			
Married	0.39	0.09 - 1.65	0.39			
Divorced/Widowed (Ref)						
<b>Sleep related disturbances</b>	3.12	1.82 - 5.37	0.000	3.10	1.79 - 5.36	<b>0.000</b>
<b>Infected with COVID-19</b>	4.54	1.41 - 14.53	0.01	4.57	1.36 - 15.35	<b>0.014</b>

IES-R: Impact of Events Scale – Revised; BAI: Beck Anxiety Inventory; OR: Odds Ratio; CI: Confidence Interval.

<b>BAI (Model with R<sup>2</sup> = 0.206)</b>												
Factor	Mild anxiety 59, 15.2%				Moderate anxiety 41, 10.5 %							
	B	OR	95% CI	P value	B	OR	95% CI	P value	B	OR	95% CI	P value
<b>Age</b>												
20-29	-0.42	0.65	0.43- 0.99	0.91	-0.72	0.48	0.27 -	<b>0.012</b>	-0.61	0.54	0.25- 1.13	0.10
30-39	0.03	1.03	0.53- 1.99	0.51	0.44	1.56	0.85	0.30	0.49	1.64	0.49- 5.43	0.41
							0.66 -					
							3.66					
<b>Marital status</b>												
Single	0.15	1.17	0.62-2.20	0.62	-0.21	0.80	0.38-	0.57	0.58	1.79	0.66- 4.86	0.25
							1.70					
<b>Occupation</b>												
Allied Health	0.35	1.43	0.97- 2.10	0.07	0.28	1.33		0.23	0.05	1.05	0.55- 1.99	0.87
							0.82-					
							2.14					
<b>Chronic illness</b>												
Smoker	0.31	1.37	0.53- 3.51	0.51	0.10	1.11		0.86	0.06	1.06	0.20- 5.46	0.94
	0.04	1.04	0.35- 3.06	0.94	1.84	6.30		<b>0.000</b>	1.31	3.70	0.88- 15.52	0.73
<b>Sleep related disturbances</b>												
	0.56	1.75	0.94- 3.25	0.07	1.31	3.71	0.32-	<b>0.000</b>	1.56	4.76	1.72- 13.12	<b>0.003</b>
	-0.33	0.71	0.28- 1.77	0.46	0.55	1.73	3.84	0.21	0.39	1.47	0.43- 5.07	0.53
<b>Quarantined</b>												
	0.91	2.50	0.50- 12.4	0.26	-0.50	0.60	2.36-	0.67	1.75	5.76	0.89- 37.20	0.06
							16.78					
<b>Infected with COVID-19</b>												
							1.78-					
							7.70					
							0.72-					
							4.18					
							0.05-					
							6.22					



## T2

IES-R (Model with R <sup>2</sup> = 0.196)												
Factor	Unadjusted				Adjusted							
	OR	95% CI	P value	OR	95% CI	P value						
<b>Age</b>												
20-29	5.44	1.23 – 24.05	<b>0.02</b>									
30-39	2.34	0.53 – 10.30	0.2									
40-49 (Ref)												
>50	2.22	0.48 – 10.26	0.30									
<b>Marital status</b>												
Single	1.77	1.21 – 2.79	<b>0.01</b>									
Married (Ref)												
Divorced/Widowed	1.08	0.22 – 5.14	0.91									
<b>Ethnicity</b>												
Asian (Ref)												
Middle eastern or North African	2.87	1.81-4.55	<b>&lt;0.001</b>	2.80	1.71- 4.58	0.000						
White	2.21	0.88- 5.54	0.08									
Others	1.11	0.31- 3.96	0.86									
<b>Chronic illness</b>	2.25	1.20 – 4.21	0.01	0.78	0.20 – 0.81	<b>0.01</b>						
<b>Sleep related disturbances</b>	2.80	1.59- 4.94	0.0004	0.25	0.15- 0.40	<b>0.00</b>						
<b>Quarantined</b>	2.00	1.29 – 3.10	0.0019	1.88	1.17 – 3.03	<b>0.09</b>						
<b>BAI (Model with R<sup>2</sup> = 0.312)</b>												
Factor	Mild anxiety 59, 15.2%				Moderate anxiety 41, 10.5 %				Severe anxiety 21, 5.4 %			
	B	OR	95% CI	P value	B	OR	95% CI	P value	B	OR	95% CI	P value
<b>Age</b>												
20-29	0.82	2.28	0.93- 5.62	0.07	0.53	1.69	0.61 – 4.71	0.30	3.38	29.60	2.71- 323.0	<b>0.005</b>
30-39	-1.34	0.87	0.39- 1.92	0.73	-0.40	0.66	0.27 – 1.59	0.35	2.66	14.35	1.41- 145.53	<b>0.024</b>
<b>Marital status</b>												
Single	0.06	1.06	0.52- 2.17	0.86	0.26	1.30	0.58- 2.95	0.51	-0.50	0.60	0.23- 1.52	0.28
<b>Ethnicity</b>												
Middle eastern or North African	-0.31	0.72	0.19- 2.66	0.63	0.78	2.18	0.24- 19.56	0.48	0.45	1.57	0.15- 15.62	0.69
White	-0.07	0.92	0.24- 3.48	0.91	1.33	3.81	0.42 – 34.24	0.23	1.77	5.91	0.61- 57.37	0.12
Others	0.14	1.61	0.21- 6.29	0.86	1.09	2.99	0.22- 39.09	0.40	1.24	3.46	0.20- 59.07	

<b>Occupation</b>												
Allied Health	1.17	3.24	1.31- 8.03	<b>0.01</b>	1.77	5.90	2.37- 14.72	<b>0.00</b>	1.61	5.03	1.65- 15.33	<b>0.004</b>
<b>Sleep related disturbances</b>												
	1.43	4.20	2.26-7.80	<b>0.00</b>	1.96	7.1	3.58- 14.09	<b>0.000</b>	2.16	8.71	3.83- 19.81	<b>0.000</b>
<b>Quarantined</b>												
	0.73	2.08	1.15- 3.77	<b>0.016</b>	0.17	1.19	0.58- 2.42	0.63	1.07	2.92	1.34- 6.38	<b>0.007</b>

At T1, HCWs who had sleep related disturbances (OR = 3.10, 95% CI: 1.79 – 5.36, p < 0.001), and those who got infected with COVID-19 (OR = 4.57, 95% CI: 1.36 – 15.35, p = 0.014) were more likely to report PTSD symptoms. At T2, HCWs who had chronic illness (OR = 0.78, 95% CI: 0.20-0.40, p < 0.001), sleep related disturbances (OR = 0.25, 95% CI: 0.15-0.40, p < 0.001), and those who quarantined (OR = 1.88, 95% CI: 1.17-3.03, p = 0.09) were more likely to suffer from PTSD symptoms.

Multinomial regression was used to identify significant predictors of anxiety. At T1, HCWs who had been infected with COVID-19 had higher odds for mild (OR=5.76, 95%CI: 0.50-12.4, p=0.260) or severe (OR=1.75, 95%CI: 0.89-37.20, p=0.060) anxiety. Subsequently, HCWs who smoked had higher odds for moderate anxiety (OR=6.30, 95%CI: 2.36-16.78, p=0.000). Furthermore, the common predictor for anxiety was sleep related disturbances, statistically significant for moderate (OR=3.70, 95%CI: 1.78-7.70, p=0.000) and severe anxiety (OR=4.76, 95%CI: 1.72-13.12, p=0.003). Furthermore, participants between 20-29 years were 0.48 times more likely to suffer from moderate anxiety (OR=0.48, 95%CI: 0.27-0.85, p=0.012).

At T2, HCWs who had sleep related disturbances had significantly higher odds of suffering from anxiety: ranging from 4.2 to 8.7 times more likely to suffer from mild, moderate, or severe anxiety, respectively (OR=4.20, 95%CI: 2.26-7.80, p=0.000; OR=7.10, 95%CI: 3.58-14.09, p=0.000; OR=8.71, 95%CI: 3.83-19.81, p=0.000). Additionally, HCWs who quarantined experienced mild (OR=2.08, 95%CI: 1.15-3.77, p=0.016) and severe (OR=2.92, 95%CI: 1.34-6.38, p=0.007) anxiety. Severe anxiety was 29.6 times more likely among those aged 20-29 (OR=29.60, 95%CI: 2.71-323.0, p=0.005) and 14.35

times more likely among those 30-39 (OR=14.35, 95%CI: 1.41-145.53, p=0.024).

### Discussion

The COVID-19 pandemic has taken a significant toll on the morbidity and mortality rates of populations worldwide, but less focus has been placed on its impact on mental health, especially among vulnerable healthcare workers (HCWs).

The results indicate that non-severe psychological distress (no PTSD) was reported among 81.1% HCWs at T1 and 80.4% HCWs at T2. Mild psychological distress (mild PTSD) was reported by 18.9% and 19.6% at T1 and T2, respectively. These findings align with a meta-analysis on the health impact of coronavirus syndromes (SARS/MERS/COVID-19) on HCWs, reporting a PTSD rate of 20.7%.<sup>9</sup> However, the study also anticipated a rise in figures as the pandemic progressed, which was observed in this study, but not significantly. The decline of psychological distress could be attributed to further understanding of the virus and implementing appropriate regulations and measures. Another explanation could be that PTSD features were more frequent in coronaviruses that had higher mortality rates such as in MERS (35%) and SARS (9.6-21%) compared to COVID-19 (2-5%).<sup>9,43</sup> Additionally, this can be attributed to several initiatives taken on by the Bahraini government and KHUH, recently recognized as important to reduce the mental health burden and trauma associated with COVID-19 for HCWs<sup>4, 6, 8, 44, 45</sup>:

- 1) Ready access to psychological support services for HCWs, ensuring that HCWs were appreciated and acknowledged for their efforts during the pandemic.
- 2) HCWs were provided the latest updates and facts

on COVID-19 regularly through online weekly lectures and email circulars so that they can make informed decisions.

- 3) Best-practice protocols and guidelines were developed and updated on a regular basis in coordination with the Bahrain National Taskforce for Combating the Coronavirus (COVID-19) to ensure HCWs face the least possible risk of contracting and spreading COVID-19. For example, HCWs were allowed to work remotely where possible and elective surgeries were cancelled and then later, reduced to 30% when the number of COVID-19 cases decreased.

Avoidance (i.e., effortful avoidance of situations that remind them of COVID-19) was the most prevalent PTSD criteria in our study population. This is contrary to a study (2020) where the most significant domain among medical care workers in China was intrusion (i.e., having repeated thoughts of the trauma).<sup>16</sup> On the other hand, a study among HCWs in Saudi Arabia found that hyperarousal was the most common.<sup>46</sup> While variance can be attributed to regional perceptions of the pandemic, our results were aligned with the mental health advice provided by the medical centre. Multiple hospital wide lectures during the COVID-19 pandemic were held at our study setting to emphasize methods of infection prevention and how to reduce levels of anxiety.

Studies conducted in Jordan and Saudi Arabia documented notably higher levels of anxiety (ranging from 38.0 - 68.2% mild anxiety, 20.8 - 21.5% moderate anxiety, and 11% severe anxiety) among HCWs compared to our study.<sup>23,25,47</sup> At T1, 30.1% reported mild to severe anxiety, and at T2, 27.4% reported mild to severe anxiety, and these rates were similar to other studies.<sup>43</sup> However, these studies underwent data collection during the acute outbreak of COVID-19, whereas our study was conducted at six and 12 months post the start of the pandemic in Bahrain. As less information was available and no vaccine drives were considered when the outbreak started, this would have led to higher anxiety rates.

Sleep related disturbances were considered the greatest risk factor for manifesting psychological distress/PTSD and anxiety.<sup>48</sup> The prevalence of sleep problems during the COVID-19 pandemic is high and affects approximately 40% of people from general and health care populations.<sup>48</sup> Other predictors included having quarantined or being infected with COVID-19. Some studies suggest that those who were infected with COVID-19 and underwent isolation had higher levels of sleep disturbances and mental health issues due to loneliness.<sup>48-51</sup> In addition, those who fell within the 20-29 age group exhibited moderate anxiety levels at T1 and severe anxiety levels at T2, highlighting the emotional burden carried by younger HCWs.

Our secondary objective was to assess the knowledge of HCWs towards the centre's psychological support services. Approximately 75% of HCWs were aware of the available services and had lower IES-R and BAI scores. HCWs who used these services also suffered from higher levels of psychological distress and anxiety than those who were unaware. Assessing knowledge and utilization of these services may be useful to explore whether they act as potential coping mechanisms for psychological distress and anxiety.<sup>48</sup>

### Limitations

Due to the study's time period, the most significant limitation is the time-sensitivity of the pandemic that affected each HCW differently. As such, it was difficult to measure the pandemic's influence on external factors that influenced psychological well-being. Secondly, the survey design did not allow for appropriate screening for mental illnesses and/or medications. As such, there is the potential for participants to underreport their negative mental health outcomes due to stigma.<sup>49, 50</sup> Another limitation is that the majority of the participants did not work directly with COVID-19 patients, which could result in assessing psychological impact in the context of a lower perceived risk of COVID-19 compared to frontliners.

## Conclusion

The COVID-19 pandemic has caused notable psychological distress and anxiety to HCWs within a teaching hospital in Bahrain and through this study, important risk factors were identified. However, our relatively lower psychological impact and anxiety rates compared to other studies may be due to initiatives taken by the Bahraini government and medical centre to reduce the mental health burden associated with COVID-19 for HCWs. It is recommended that in addition to strict measures of infection prevention and acute care provided to infected HCWs during a pandemic, a responsive and proactive strategy by the leadership should be taken. These strategies should aim to implement interventions focused on psychological support to improve mental wellbeing and reduce levels of distress and anxiety.

## References

1. World Health Organization. *WHO Coronavirus Disease (COVID-19) Dashboard*. Geneva: World Health Organization 2020. Available from: <https://covid19.who.int/> (last cited: 3 June 2020).
2. Ieraci A, Mallei A, Popoli M. Social isolation stress induces anxious-depressive-like behavior and alterations of neuroplasticity-related genes in adult male mice. *Neural Plast*. 2016. Available from <https://doi.org/10.1155/2016/6212983>.
3. Das SK, Barhwal K, Hota SK, et al. Disrupting monotony during social isolation stress prevents early development of anxiety and depression like traits in male rats. *BMC neurosci*. 2015;16(2).
4. Ransing R, Adiukwu F, Pereira-Sanchez V, et al. Mental Health Interventions during the COVID-19 Pandemic: A Conceptual Framework by Early Career Psychiatrists. *Asian J Psychiatr*. 2020;51. Available from: <https://doi.org/10.1016/j.ajp.2020.102085>
5. Bansal P, Bingemann TA, Greenhawt M, et al. Clinician Wellness During the COVID-19 Pandemic: Extraordinary Times and Unusual Challenges for the Allergist/Immunologist. *J Allergy Clin Immunol Pract*. 2020;8:1781-90.
6. Kisely S, Warren N, McMahon L, et al. Occurrence, prevention, and management of the psychological effects of emerging virus outbreaks on healthcare workers: rapid review and meta-analysis. *BMJ*. 2020;369. Available from <https://doi.org/10.1136/bmj.m1642>.
7. World Health Organization Regional Office for Europe. *Mental health and COVID-19*. Geneva: World Health Organization 2020. Available from: <http://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/technical-guidance/mental-health-and-covid-19>. (last cited 3 June 2020).
8. Pereira-Sanchez V, Adiukwu F, El Hayek S, et al. COVID-19 effect on mental health: patients and workforce. *Lancet Psychiatry*. 2020;7:29-30.
9. de Pablo G, Serrano J, Catalan A, et al. Impact of coronavirus syndromes on physical and mental health of health care workers: Systematic review and meta-analysis. *J Affect Disord*. 2020;275: 48-57.
10. Shaukat N, Ali D, Razzak, J. Physical and mental health impacts of COVID-19 on healthcare workers: a scoping review. *Int J Emerg*. 2020;13:1-8.
11. Du J, Dong L, Wang T, et al. Psychological symptoms among frontline healthcare workers during COVID-19 outbreak in Wuhan. *Gen Hosp Psychiatry* 2020. Available from <https://doi.org/10.1016/j.genhosppsy.2020.03.011>.
12. Kaveh M, Davari-tanha F, Varaei S, et al. Anxiety levels among Iranian health care workers during the COVID-19 surge: A cross-sectional study. *medRxiv* [Preprint] 2020;1. Available from <https://doi.org/10.1101/2020.05.02.20089045>.
13. Tan B, Chew N, Lee G, et al. Psychological Impact of the COVID-19 Pandemic on Health Care Workers in Singapore. *Ann Intern Med*. 2020;173:317-20.
14. Zhu Z, Xu S, Wang H, et al. COVID-19 in Wuhan: Immediate Psychological Impact on 5062 Health Workers. *MedRxiv*. 2020. Available from <https://doi.org/10.1101/2020.02.20.20025338>

15. Chew N, Lee G, Tan B, et al. A multinational, multicentre study on the psychological outcomes and associated physical symptoms amongst healthcare workers during COVID-19 outbreak. *Brain Behav Immun* 2020; 88: 559-65.
16. Si M, Su X, Jiang Y, et al. Psychological impact of COVID-19 on medical care workers in China. *Infect Dis Poverty* 2020. Available from <http://dx.doi.org/10.2139/ssrn.3592642>
17. Alhaj A, Al-Saadi T, Mohammad F, et al. Neurosurgery Residents' Perspective on COVID-19: Knowledge, Readiness, and Impact of this Pandemic. *World Neurosurg* 2020; 139: 848-58.
18. Robbins J, England E, Patel M, et al. COVID-19 Impact on Well-Being and Education in Radiology Residencies: A Survey of the Association of Program Directors in Radiology. *Acad Radiol* 2020; 27: 1162-72.
19. Semaan A, Audet C, Huysmans E, et al. Voices from the frontline: findings from a thematic analysis of a rapid online global survey of maternal and newborn health professionals facing the COVID-19 pandemic. *MedRxiv*. 2020 [Preprint]. Available from <https://doi.org/10.1101/2020.05.08.20093393>.
20. Yildirim T, Atas O, Asafov A, et al. Psychological Status of Healthcare Workers during the Covid-19 Pandemic. *JCPSP – J COLL PHYSICI*. 2020;30:26-31.
21. Khattab M, Kannan T, Morsi A, et al. The short-term impact of COVID-19 pandemic on spine surgeons: a cross-sectional global study. *Eur Spine J*. 2020;29:1806-12.
22. Badahdah AM, Khamis F, Al Mahyijari N. The psychological well-being of physicians during COVID-19 outbreak in Oman. *Psychiatry Res*. 2020;289:113053. Available from <https://doi.org/10.1016/j.psychres.2020.113053>
23. Naser AY, Dahmash EZ, Al-Rousan R, et al. Mental health status of the general population, healthcare professionals, and university students during 2019 coronavirus disease outbreak in Jordan: A cross-sectional study. *Brain Behav*. 2020;10:e01730. Available from <https://doi.org/10.1002/brb3.1730>.
24. Suleiman A, Bsisu I, Guzu H, et al. Preparedness of Frontline Doctors in Jordan Healthcare Facilities to COVID-19 Outbreak. *Int J Environ Res Public Health*. 2020;17:3181.
25. Temsah MH, Al-Sohime F, Alamro N, et al. The psychological impact of COVID-19 pandemic on health care workers in a MERS-CoV endemic country. *J Infect Public Health* 2020;13:877-82
26. Maraqa B, Nazzal Z, Zink T. Palestinian Health Care Workers' Stress and Stressors During COVID-19 Pandemic: A Cross-Sectional Study. *J Prim Care Community Health*. 2020. Available from <https://doi.org/10.1177/2150132720955026>.
27. Zhang S, Liu J, Jahanshahi A, et al. At the height of the storm: Healthcare staff's health conditions and job satisfaction and their associated predictors during the epidemic peak of COVID-19. *Brain Behav Immun*. 2020;87:144-6.
28. Almater AI, Tobaigy MF, Younis AS, et al. Effect of 2019 Coronavirus Pandemic on Ophthalmologists Practicing in Saudi Arabia: A Psychological Health Assessment. *Middle East Afr J Ophthalmol*. 2020;27:79-85.
29. AlAteeq DA, Aljhani S, Althiyabi I, et al. Mental health among healthcare providers during coronavirus disease (COVID-19) outbreak in Saudi Arabia. *J Infect Public Health*. 2020;13:1432-7.
30. Al-Hanawi MK, Mwale ML, Alshareef N, et al. Psychological Distress Amongst Health Workers and the General Public During the COVID-19 Pandemic in Saudi Arabia. *Risk Manag Healthc P*. 2020;13:733-42.
31. AlSalman A, Mubarak H, Aljabal M, et al. The psychological impact of COVID-19 Pandemic on the population of Bahrain. *Acta Bio Medica: Atenei Parmensis*. 2020;91(4).
32. Al Noaimi HM, Al Noaimi MM, Al Fayeze FM, et al. The impact of COVID-19 pandemic on mental health of health care workers of Bahrain

- defence force royal medical services. Bahrain Medical Bulletin. 2021:580-7.
33. World Health Organization. *WHO Coronavirus Disease (COVID-19) Dashboard*. Geneva: World Health Organization 2020. Available from: <https://covid19.who.int/region/emro/country/bh> (last cited: 26 October 2020).
  34. Bahrain human development report 2018. *Pathways to Sustainable Economic Growth in Bahrain*. 2018. Available from <https://www.derasat.org.bh/wp-content/uploads/2019/07/Bahrain%20Human%20Development%20Report%202018.pdf>. (last cited: 23 Sept 2020).
  35. Lwanga SK, Lemeshow S, World Health Organization. Sample size determination in health studies: a practical manual. World Health Organization; 1991.
  36. Weiss DS, Marmar CR. *The impact of event scale – revised*. In: Wilson JP, Keane TM, editors. Assessing psychological trauma and PTSD. New York: Guilford Press. 1996:399–411.
  37. Horowitz M, Wilner N, Alvarez W. Impact of Event Scale: A measure of subjective stress. *Psychosom Med*. 1979;41:209-18.
  38. Beck JG, Grant DM, Read JP, et al. The Impact of Event Scale-Revised: Psychometric properties in a sample of motor vehicle accident survivors. *J Anxiety Disord*. 2008;22:187-98.
  39. Creamer M, Bell R, Failla S. Psychometric properties of the Impact of Event Scale-Revised. *Behav Res Ther*. 2003;41:1489–96.
  40. McAlonan GM, Lee AM, Cheung V, et al. Immediate and sustained psychological impact of an emerging infectious disease outbreak on health care workers. *Can J Psychiatry*. 2007;52:241-7.
  41. Huarcaya-Victoria J, Villarreal-Zegarra D, Podestà A, et al. Psychometric Properties of a Spanish Version of the Fear of COVID-19 Scale in General Population of Lima, Peru. *Int J Ment Health Addict*. 2020. Available from <https://doi.org/10.1007/s11469-020-00354-5>.
  42. Bardhoshi G, Duncan K, Erford BT. Psychometric meta-analysis of the English version of the Beck Anxiety Inventory. *J Couns Dev*. 2016;94:356-73.
  43. Pappa S, Ntella V, Giannakas T, et al. (2020). Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: A systematic review and meta-analysis. *SSRN Electronic Journal*. 2020;88,901–7. <https://doi.org/10.2139/ssrn.3594632>
  44. Ursachi G, Horodnic IA, Zait A. How reliable are measurement scales? External factors with indirect influence on reliability estimators. *Procedia Econ*. 2015;20:679-86.
  45. Awais S, Martins R, Khan M. Paramedics in pandemics: Protecting the mental wellness of those behind enemy lines. *Br J Psychiatry*. 2020:1-2. Available at <https://doi.org/10.1192/bjp.2020.193>
  46. Chan KL, Chau WW, Kuriansky J, et al. The psychosocial and interpersonal impact of the SARS epidemic on Chinese health professionals: Implications for epidemics, including Ebola. The Psychosocial Aspects of a Deadly Epidemic: What Ebola Has Taught Us about Holistic Healing: What Ebola Has Taught Us about Holistic Healing. 2016;21:287.
  47. Zaki NF, Sidiq M, Qasim M, et al. Stress and psychological consequences of COVID-19 on health-care workers. *J Nat Sci*. 2020;3:299-307.
  48. Jahrami H, Alhaj O, Humood A, et al. Sleep disturbances during the covid-19 pandemic: A systematic review, meta-analysis, and meta-regression. *Sleep Medicine Reviews*. 2022:101591. <https://doi.org/10.1016/j.smrv.2022.101591>
  49. Gupta S, Sahoo S. Pandemic and mental health of the front-line healthcare workers: a review and implications in the Indian context amidst COVID-19. *Gen Psychiatry*. 2020;33:e100284. Available from <https://doi.org/10.1136/gpsych-2020-100284>
  50. Al Saif F, Al Shakhouri H, Nooh S, et al. Association between attitudes of stigma toward

mental illness and attitudes toward adoption of evidence-based practice within health care providers in Bahrain. *PLoS One*. 2019;14:1-19.

51. da Silva M, Rocha R, Buheji M, et al. A systematic review of the prevalence of anxiety symptoms

during coronavirus epidemics. *Journal of Health Psychology*. 2021;26(1):115–25. <https://doi.org/10.1177/1359105320951620>