

Level of anxiety among healthcare providers during COVID-19 pandemic in Saudi Arabia: cross-sectional study

Abbas Al Mutair^{1,2,3}, Alya Al Mutairi⁴, Yasmine Alabbasi⁵,
Abbas Shamsan⁶, Sana Al-Mahmoud⁷, Saad Alhumaid⁸,
Muhammad zeshan Arshad⁹, Mansour Awad¹⁰ and Ali Rabaan^{11,12}

¹ College of Nursing, Princess Norah University, Riyadh, Saudi Arabia

² School of Nursing, University of Wollongong, Wollongong, Australia

³ Research Center, Almoosa Specialist Hospital, Al-ahsa, Saudi Arabia, Al-Ahsa, Saudi Arabia

⁴ Department of Mathematics, Faculty of Science, Taibah University, Medina, Saudi Arabia

⁵ Maternity and Child Health Nursing Department, College of Nursing, Princess Nourah bint Abdulrahman University, Riyadh, Saudi Arabia

⁶ Research Center, Dr. Sulaiman Al Habib Medical Group, Riyadh, Saudi Arabia

⁷ Imam Abdurrahman Bin Faisal University, Riyadh, Saudi Arabia

⁸ Administration of Pharmaceutical Care, Al-Ahsa Health Cluster, Ministry of Health, Riyadh, Saudi Arabia

⁹ Department of Mathematics and Statistics, University of Agriculture, Faisalabad, Pakistan

¹⁰ Commitment Administration, General Directorate of Health Affairs, Medina, Medina, Ministry of Health, Saudi Arabia

¹¹ Molecular Diagnostic Laboratory, Johns Hopkins Aramco Healthcare, Dhahran, Saudi Arabia

¹² Department of Public Health and Nutrition, the University of Haripur, Haripur, Pakistan

ABSTRACT

Background: The burden of the spread of the COVID-19 pandemic has impacted widely on the healthcare providers physically and mentally. Many healthcare providers are exposed to psychological stressors due to their high risk of contracting the virus.

Aims: This study aimed to measure the level of anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia. In addition, this study aimed to measure the level of anxiety based on demographic characteristics.

Method: A cross-sectional survey was employed to recruit a convenience sample of healthcare providers. A pencil and paper self-administered questionnaires were used to collect data from demographic and generalized anxiety disorder GAD-7 data. However, this study received written informed consent from participants of the study. In addition, the study was approved by the Institutional Review Board at Dr. Sulaiman Al Habib Medical Group (IRB Log No. RC20.06.88-03).

Results: A total of 650 participants were recruited, results of GAD-7 showed that 43.5%, 28.9% and 27.5% of healthcare providers in Saudi Arabia experienced mild, moderate and severe anxiety, respectively, during the COVID-19 pandemic. Results indicated that age, health specialty, nationality, and sleeping disorders before COVID-19 were associated with anxiety levels.

Conclusion: The generalized anxiety among healthcare providers in Saudi Arabia was mild. Older healthcare providers were found to have a higher level of anxiety compared to other participating healthcare providers. Several factors may contribute to a higher level of anxiety including age, socioeconomic status, marital status, having chronic conditions, and sleeping disorder before the COVID-19 pandemic.

Submitted 5 May 2021
Accepted 15 August 2021
Published 2 September 2021

Corresponding author
Alya Al Mutairi,
amutairi@taibahu.edu.sa

Academic editor
Alberto Davalos

Additional Information and
Declarations can be found on
page 13

DOI 10.7717/peerj.12119

© Copyright
2021 Al Mutair et al.

Distributed under
Creative Commons CC-BY 4.0

OPEN ACCESS

To further understand the level of anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia, longitudinal and mixed-method research is needed.

Subjects Infectious Diseases, Nursing, Psychiatry and Psychology

Keywords COVID-19, Anxiety, Healthcare provider, Mental health, Health care facilities, Saudi Arabia

BACKGROUND

The coronavirus disease of 2019 (COVID-19) outbreak has spread across the world; besides, there is a degree of uncertainty, concern, and worry among healthcare providers (*World Health Organization, 2021; Mental Health America, 2020*). These excessive worries, intrusive thoughts, and stress may have an impact on the level of anxiety and mental health of healthcare providers (*Mental Health America, 2020; American Psychological Association, 2021*). In times of pandemics, such as COVID-19, healthcare providers, as the frontline force, may be prone to mental stress due to uncertainty about infectious disease and fear of contracting the virus and transmitting it to loved ones (*Wang et al., 2020*). Workplace stress in healthcare industry is persistent due to several reasons including exposing to infectious diseases leading to illness or death (*Al Mutair et al., 2021*). This may produce high rates of anxiety and depression among health care providers (*Magnavita et al., 2021*). Burnout among health care providers is also dominant due to infection and other stressors such as shortage of staff, patients load or long working hours (*Al Mutair et al., 2021*). There is growing evidence of that pandemic such as COVID-19 produces high burnout level among healthcare providers and may impact negatively on the healthcare workers mental health and emotional wellbeing (*Chirico & Magnavita, 2020; Chirico et al., 2021; Chirico & Nucera, 2020*).

A national survey evaluating the psychological impact of COVID-19 among the general public in China during the initial stages of the COVID-19 outbreak found that 28% of respondents reported moderate to severe anxiety symptoms (*Wang et al., 2020*). Another study in China found that the prevalence of anxiety was 44.7% (GAD 7 \geq 5) among healthcare providers (*Zhang & Ma, 2020*). A survey from Mental Health America (MHA) reported that 86% of healthcare providers regularly experienced anxiety from June 2020 to September 2020 during the COVID-19 outbreak (*Mental Health America, 2020*). In Saudi Arabia, the first case of COVID-19 infection was reported on March 02, 2020, amid growing concerns and uncertainties among the community and healthcare providers (*Ministry of Health, 2020*). COVID-19 cases which were reported in Saudi Arabia vary in their severities from mild, moderate to severe (*Al Mutair et al., 2020b; Al-Omari et al., 2020b*). Healthcare providers in Saudi Arabia are exposed to a high level of stressors due to high susceptibility to getting infected which may result in a high level of burnout (*Al Mutair et al., 2018; Al Mutair et al., 2020a; Al-Omari et al., 2020a; Al Mutair et al., 2017; Fernandez et al., 2020*). Most studies have assessed the effect of COVID-19 on the anxiety and mental health of healthcare providers in China (*De Kock et al., 2021*).

However, to our knowledge, there are limited studies evaluating anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia. Therefore, the purpose of this study is to measure the level of anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia. In addition, this study aims to measure the level of anxiety based on demographic characteristics. We hypothesized that levels of anxiety among healthcare providers were associated with their demographic characteristics during the COVID-19 pandemic in Saudi Arabia.

Aim of the study

To measure the level of anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia. Besides that, this study aimed to measure the level of anxiety based on demographic characteristics.

METHODS

Study design

A cross-sectional survey study was employed to recruit a convenience sample of healthcare providers during the COVID-19 pandemic in Saudi Arabia. Prior to data collection, and ethical approval to conduct the study was sought from the Institutional Review Board at Dr. Sulaiman Al Habib Medical Group (IRB Log No. RC20.06.88-03). In addition, participants were ensured that taking part in the study is voluntary and that all gathered information will only be used for the study purposes and will be kept secured and confidential. For this cross-sectional study, no informed consent was deemed necessary and was waived by the IRB. Data were identified for the use of this publication and the study adhered to the ethical guidelines of the Declaration of Helsinki and good clinical practice.

Both Saudi and non-Saudi healthcare providers were invited to participate in the current study. Participants were included if they met the following criteria: 22 years old or above, responsible for providing direct patient care in an inpatient or outpatient healthcare setting, and spent at least six months in the current clinical unit. The sample size was estimated using G*Power3 and based on the confidence level of 95%, power of 80%, and medium effect size as determined by the literature review. The minimum required sample size was 356 subjects. A total of 900 questionnaires were distributed among healthcare providers who work in the private and public healthcare sector in Riyadh city in Saudi Arabia between April 1 and 15, 2020. A total of 650 participants returned the completed surveys giving a response rate of 72% (Fig. 1).

Data collection instrument

A pencil and paper self-administered questionnaire were used to collect data from the participants. The questionnaire consisted of socio-demographic characteristics including: age, gender, nationality, working area, profession, type of healthcare facility and years of working experience. The questionnaire also consisted of Generalized Anxiety Disorder GAD-7. The Generalized Anxiety Disorder Scale-7 CAD-7 was developed by Spitzer and colleagues (Spitzer et al., 2006). It is self-rated scales and consists of 7 items which have

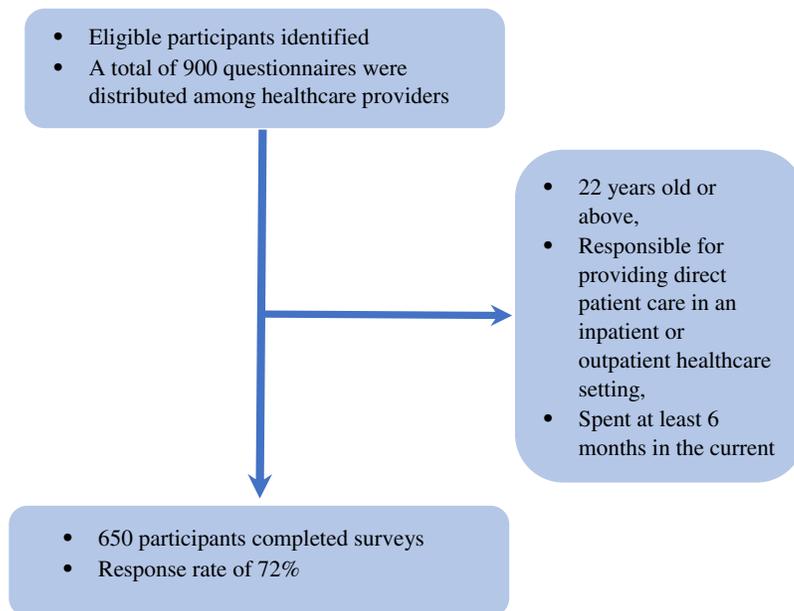


Figure 1 Flow chart.

Full-size  DOI: [10.7717/peerj.12119/fig-1](https://doi.org/10.7717/peerj.12119/fig-1)

been used in multiple studies and had shown acceptable reliability and good validity for assessing anxiety disorder in clinical practice and research (*Rutter & Brown, 2017*). CAD-7 items are rated on a 4-point Likert Scale (0 = not at all, 1 = several days, 2 = over half the days and 3 = nearly every day). The scale items describe the diagnostic features of the generalized anxiety disorder. The scale scores can range from 0 indicating no anxiety symptoms to 21 indicating more severe anxiety symptoms.

Data analysis

In this study standard statistical procedures were applied, data was collated into an excel spread sheet and then imported into the Statistical Package for Social Sciences (SPSS, version 25). The data was validated for accuracy and completeness before conducting the statistical analysis. A detailed descriptive and inferential statistics for all the variables constituting the socio-demographic characteristics questionnaire and Generalized Anxiety Disorder GAD-7. A descriptive analysis for socio-demographic and perceptual variables was completed in order to capture frequencies, means and standard deviations. Frequency distributions for continuous variables were examined *via* Shapiro-Wilk test and appropriate statistical tests were applied accordingly. An inferential statistics chi-square analysis was employed to study the association between demographic profile and GAD-7. *P*-values of ≤ 0.05 were accepted as the significance level for all inferential statistical tests that were conducted.

RESULTS

Demographic profile has been analyzed and the findings are presented in [Table 1](#). Several demographic profiles have been chosen, namely type of health care facility, age, gender, nationality, the health specialty, hospital department, experiences (years), sleeping

Table 1 Demographic characteristics of the respondents.

Demography profile	General anxiety disorder (GAD-7)			n	%
	Mild	Moderate	Severe		
Type of facility					
Government	86 (42.6%)	66 (32.7%)	50 (24.8%)	202	31.3%
Private	194 (43.7%)	121 (27.3%)	129 (29.1%)	444	68.7%
Age					
20–30 years old	70 (56.9%)	32 (26%)	21 (17.1%)	123	32.4%
31–40 years old	73 (41.2%)	56 (31.6%)	48 (27.1%)	177	46.6%
41–50 years old	34 (54%)	14 (22.2%)	15 (23.8%)	63	16.6%
>50 years old	12 (70.6%)	4 (23.5%)	1 (5.9%)	17	4.5%
Gender					
Male	78 (46.7%)	52 (31.1%)	37 (22.2%)	167	26.0%
Female	199 (41.9%)	134 (28.2%)	142 (29.9%)	475	74.0%
Nationality					
Saudi	66 (34.9%)	67 (35.4%)	56 (29.6%)	189	29.6%
Non Saudi	210 (46.7%)	119 (26.4%)	121 (26.9%)	450	70.4%
Profession					
Physician	45 (39.5%)	37 (32.5%)	32 (28.1%)	114	17.7%
Nurse	159 (49.2%)	81 (25.1%)	83 (25.7%)	323	50.2%
Others	76 (36.7%)	70 (33.8%)	61 (29.5%)	207	32.1%
Work area					
ER	18 (34.6%)	21 (40.4%)	13 (25%)	52	8.2%
Ward	71 (53%)	28 (20.9%)	35 (26.1%)	134	21.1%
ICU	100 (41.2%)	72 (29.6%)	71 (29.2%)	243	38.3%
Others	86 (41.7%)	63 (30.6%)	57 (27.7%)	206	32.4%
Years of experience					
1–5 years	126 (45%)	85 (30.4%)	69 (24.6%)	280	44.3%
6–10 years	64 (36.2%)	54 (30.5%)	59 (33.3%)	177	28.0%
11 years and above	84 (48%)	46 (26.3%)	45 (25.7%)	175	27.7%
Sleeping disorder*					
Yes	21 (26.3%)	32 (40%)	27 (33.8%)	80	13.1%
No	250 (47%)	153 (28.8%)	129 (24.2%)	532	86.9%
Mental disorder*					
Yes	4 (20%)	7 (35%)	9 (45%)	20	3.3%
No	268 (45.3%)	175 (29.6%)	149 (25.2%)	592	96.7%

Note:

* Before covid-19 incident.

disorder before COVID-19 and mental disorder. In terms of healthcare facilities, 444 (68.7%) were private facilities while only 202 (31.3%) government. By looking at the age, about 177 (46.6%) of the respondents were at the age range 31–40 years old, followed by 123 (32.4%) were 20–30 years old, 63 (16.6%) were 41–50 years old and small percentage 17 (4.5%) were above 50 years old. It was reported that more females 475 (74%)

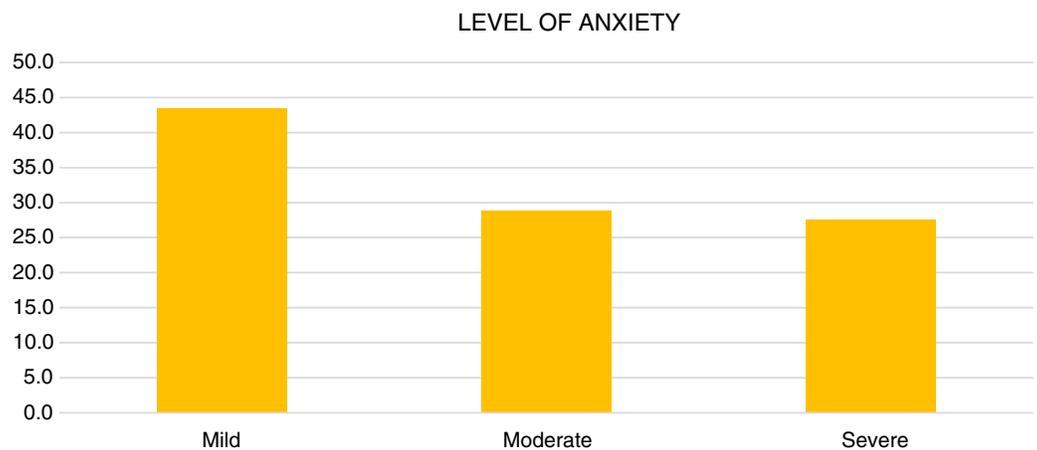


Figure 2 Level of anxiety.

Full-size DOI: 10.7717/peerj.12119/fig-2

Table 2 Level of anxiety.

Level of anxiety	Frequency	Percent
Mild	283	43.5
Moderate	188	28.9
Severe	179	27.5
Total	650	100.0

than males 167 (26%). Almost three-quarters of the respondents 450 (70.4%) were non-Saudi while 189 (26%) were Saudi. By studying the health specialty, about 323 (50.2%) of the respondents were nurses, followed by 207 (32.1%) who were others and 114 (17.7%) physicians. Approximately 243 (38.3%) of the respondents worked at ICU department, followed by 206 (32.4%) worked in other departments, 134 (21.1%) wards and 52 (8.2%) worked at Emergency department. By studying the year of experience, a total of 280 (44.3%) with working experience 1–5 years, followed by 177 (28%) worked 6–10 years and 175 (27.7%) worked 11 years and above. Respondents were asked about sleeping disorder before COVID-19, about 532 (86.9%) did not have sleeping disorder while 80 (13.1%) had sleeping disorder before COVID-19. Lastly, in terms of mental disorder, about 592 (96.7%) did not report any mental disorder, while 20 (3.3%) had mental disorder.

Level of anxiety

Level of anxiety has been divided into three levels: mild, moderate and severe anxiety. The findings demonstrated about 283 (43.5%) had mild anxiety, followed by 188 (28.9%) had moderate anxiety and 179 (27.5%) had severe anxiety as shown in [Table 2](#) and [Fig. 2](#).

The association between demographic characteristics and level of anxiety

Chi-square analysis has been computed to examine the association between level of anxiety and demographic profile (see [Table 3](#)). As reported, age ($X^2 = 12.892$, $df = 6$, $p < 0.05$), nationality ($X^2 = 8.321$, $df = 2$, $p < 0.05$), health specialty ($X^2 = 9.543$, $df = 4$, $p < 0.05$) and

Table 3 The association between demographic characteristics and level of anxiety.

Variables	Mild		Moderate		Severe		Value	df	sig.
	<i>n</i>	%	<i>N</i>	%	<i>N</i>	%			
Type of health care facilities							2.377	2	0.305
Government	86	42.6	66	32.7	50	24.8			
Private	194	43.7	121	27.3	129	29.1			
Age							12.892	6	0.045
20–30	70	56.9	32	26.0	21	17.1			
31–40	73	41.2	56	31.6	48	27.1			
41–50	34	53.97	14	22.2	15	23.8			
Above 50 years	12	70.6	4	23.5	1	5.9			
Gender							3.683	2	0.159
Male	78	46.7	52	31.1	37	22.2			
Female	199	41.9	134	28.2	142	29.9			
Nationality							8.321	2	0.016
Saudi	66	34.9	67	35.4	56	29.6			
Non-Saudi	210	46.7	119	26.4	121	26.9			
Health specialty							9.543	4	0.049
Physicians	45	39.5	37	32.5	32	28.1			
Nurses	159	49.2	81	25.1	83	25.7			
Others	76	36.7	70	33.8	61	29.5			
Hospital Department							10.216	6	0.116
ER Department	18	34.6	21	40.4	13	25.0			
Ward	71	53.0	28	20.9	35	26.1			
ICU Department	100	41.2	72	29.6	71	29.2			
Others	86	41.7	63	30.6	57	27.7			
Years of experience							7.134	4	0.129
1–5 years	126	45.0	85	30.4	69	24.6			
6–10 years	64	36.2	54	30.5	59	33.3			
11 years and above	84	48.0	46	26.3	45	25.7			
Sleeping disorder before Covid-19							12.127	2	0.002
Yes	21	26.3	32	40.0	27	33.8			
No	250	47.0	153	28.8	129	24.2			
Mental Disorder							5.919	2	0.052
Yes	4	20.0	7	35.0	9	45.0			
No	268	45.3	175	29.6	149	25.2			

sleeping disorder before COVID-19 ($X^2 = 12.127$, $df = 2$, $p < 0.05$) have significant association with anxiety level. While type of health care facilities ($X^2 = 2.377$, $df = 2$, $p > 0.05$), gender ($X^2 = 3.683$, $df = 2$, $p > 0.05$), hospital department ($X^2 = 10.216$, $df = 6$, $p > 0.05$), years of experience ($X^2 = 7.134$, $df = 4$, $p > 0.05$) and mental disorder ($X^2 = 5.919$, $df = 2$, $p > 0.05$) have no significant association with level of anxiety. Descriptive analysis is shown in [Table 4](#). In terms of age, we found that respondents at the

Table 4 Descriptive analysis (frequency, percentage, mean and SD).

Demographic profile	N	%	Mean	SD
Type of health care facility				
Government	202	31.3	7.39	5.34
Private	444	68.7	7.73	6.02
Age				
20–30 years old	123	32.4	6.24	4.92
31–40 years old	177	46.6	7.62	5.37
41–50 years old	63	16.6	5.98	5.18
Above 50 years old	17	4.5	4.29	4.00
Gender				
Male	167	26.0	6.79	5.61
Female	475	74.0	7.96	5.86
Nationality				
Saudi	189	29.6	8.33	5.54
Non Saudi	450	70.4	7.34	5.88
Health specialty				
Physicians	114	17.7	7.66	5.70
Nurses	323	50.2	7.26	5.68
Others	207	32.1	8.05	6.02
Hospital Department				
ER Department	52	8.2	7.73	5.65
Ward	134	21.1	7.21	6.05
ICU Department	243	38.3	7.75	5.53
Others	206	32.4	7.72	6.01
Years of experience				
1–5 years	280	44.3	7.43	5.62
6–10 years	177	28.0	8.68	6.16
11 years and above	175	27.7	6.78	5.59
Sleeping disorder before covid-19				
Yes	80	13.1	8.98	5.33
No	532	86.9	7.05	5.51
Mental Disorder				
Yes	20	3.3	11.11	6.39
No	592	96.7	7.20	5.49

age 31–40 years (46.6 ± 7.62) perceived anxiety significantly higher than above 50 years old (4.5 ± 4.29). Additionally, Saudi perceived more anxiety (8.33 ± 5.54) as compared to non-Saudi (7.33 ± 5.88). In terms of health specialty, others healthcare providers (8.05 ± 6.01) exhibited higher anxiety level as compared to nurses (7.26 ± 5.68). Also, those who had sleeping disorders before COVID-19 (8.98 ± 5.32) perceived higher anxiety than those who did not have sleeping disorder (7.04 ± 5.51).

Table 5 Model summary statistic.

Model summary	Chi-square	df	p Value	R2
Model fitting information				
Final model	19.292	3	<0.001	
Goodness-of-Fit				
Pearson	10.897	11	0.452	
Deviance	11.231	11	0.424	
Pseudo R-square				
Cox and Snell				0.031
Nagelkerke				0.035
McFadden				0.015
Test of parallel lines				
General	5.826	3	0.120	

Note:

Link function: Logit.

Table 6 Summary statistic for ordinal logistic regression estimation.

Parameter estimates	B	OR	95% CI		Wald	df	p Value
			Lower	Upper			
Threshold							
(LEVEL_ANXIETY = 1.00)	-0.121				1.4	1	0.245
(LEVEL_ANXIETY = 2.00)	1.221				110.7	1	0.000
Location							
(Gender = 1) Male	-0.388	0.678	0.475	0.970	4.5	1	0.034
(Gender = 2) Female (ref.)							
(Nationality = 1) Saudi	0.460	1.584	1.127	2.226	7.0	1	0.008
(Nationality = 2) Non Saudi (ref.)							
(SleepingDisorder = 1) Yes	0.555	1.742	1.119	2.713	6.0	1	0.014
(SleepingDisorder = 2) No (ref.)							

Note:

Link function: Logit.

Effect of demographic factors on level of anxiety

The Chi-square test showed that working experience and age groups were highly associate ($p < 0.001$). The results showed that older age groups were associate with longer working experience. The final results of ordinal logistic regression were summarized and presented in [Tables 5](#) and [6](#). In the final model, only three significant factors were remained; gender, nationality, and sleeping disorder. They were found to significantly explain the odds of having general anxiety disorder. Based on summary statistic, final model was significant ($X^2 = 19.292$, $df = 3$, $p < 0.05$). As for goodness of fit index, both Pearson ($X^2 = 10.897$, $df = 11$, $p > 0.05$) and Deviance ($X^2 = 11.231$, $df = 11$, $p > 0.05$) showed that the final model has good fit with the data. Lastly, the assumption of proportional odds (parallel lines test) showed that the assumption was met ($X^2 = 5.826$, $df = 3$, $p > 0.05$). Therefore, the model results can be used for interpretation. Gender has

effect on participants' anxiety level, the P value of -0.38 indicating that male participants are less likely to classify with higher level of anxiety compared to female (Table 6). The results showed that the odds of male participants to have higher anxiety level are 0.67 (95% CI [0.475–0.970]) times than that of female respondents with significant statistic values of Wald $\chi^2(1) = 4.5$, $p = 0.034$. Additionally, Saudi participants are more likely to develop higher level of anxiety compared to non-Saudi 1.584 (95% CI [1.127–2.226]) times higher than non-Saudi respondents, supported with statistical values of Wald $\chi^2(1) = 7.0$, $p = 0.008$. The results showed that participants with sleeping disorder before COVID-19 are prone to classify with higher level of anxiety compared to those who do not have such disorder 1.742 (95% CI [1.119–2.713]) times higher than those without sleeping disorder, with statistical significance value of Wald $\chi^2(1) = 6.0$, $p = 0.014$.

DISCUSSION

During the novel coronavirus pandemic healthcare providers are risking their lives and continue working with tremendous efforts towards their ethical and professional obligations. Not only do healthcare providers be under psychological distress during the epidemic, but also psychological consequences might accrue on the long-term (Al Mutair et al., 2021; Al Mutair et al., 2020b). This study measured the level of anxiety based on demographic characteristics among healthcare providers during the COVID-19 pandemic in Saudi Arabia. Survey results showed that 43.5%, 28.9% and 27.5% of healthcare providers in Saudi Arabia experienced mild, moderate, and severe anxiety, respectively, during the pandemic. Even though, during MERS-CoV epidemic in Saudi Arabia, research show that hospital staff faced stressful times, and they felt anxious, nervous, and emotionally distressed (Al Mutair & Ambani, 2020). Also, Unlike SARS and Ebola versus there were psychological consequences among hospital staffs (Lin et al., 2007; Lehmann et al., 2015). However, same finding were found in a recent meta-analysis which showed that lower rates of anxiety and depression during COVID-19 than the reported rates among healthcare providers during and after MERS and SARS (Pappa et al., 2020). There were associations between some demographic characteristics and the level of anxiety. Age, health specialty, nationality, and sleeping disorders before COVID-19 were associated with anxiety levels, whereas other demographic characteristics, such as type of healthcare facility, gender, hospital department, years of experience, and mental disorders, did not influence anxiety levels. This study found that respondents between the ages of 31–40 years experienced significantly higher anxiety than respondents above 50 years old. A comparable study conducted in Saudi Arabia in March 2020 measured depression and anxiety among healthcare providers and found that participants between 30 and 39 years old were significantly associated with anxiety (7.40 ± 6.59 , $p < 0.001$) (Al-Omari et al., 2020a). Contrary to previous studies (Al Mutair et al., 2017; Fernandez et al., 2020; De Kock et al., 2021) our study found that healthcare providers other than nurses showed higher anxiety levels (8.05 ± 6.01) compared to nurses (7.26 ± 5.68). A possible reason was the difference in demographic characteristics. The study sample mainly consisted of non-Saudi healthcare providers and many

non-Saudi healthcare providers may live away from their loved ones. This may contribute to anxiety and depression level increase among healthcare providers, as non-Saudi mainly live alone and away from their family which may result in high level of anxiety and psychological distress (*Al Mutair et al., 2020b*). Our study further measured the level of anxiety based on nationality. Findings showed that anxiety levels among Saudi healthcare providers (8.33 ± 5.54) were significantly higher than non-Saudi providers (7.33 ± 5.88). Many factors may contribute to higher anxiety levels among Saudi healthcare providers, regardless of their professional designation. These include socioeconomic status, marital status, having a chronic health condition, fear of contracting the virus, living with an immunocompromised, chronically ill, or elderly person (*AlAteeq et al., 2020; Lai et al., 2020; Alenazi et al., 2020*). A Saudi-based study measuring the overall emotional wellbeing and its predictors of the Saudi population during the COVID-19 pandemic found that age, gender, marital status, and socioeconomic status are majors' predictors of emotional wellbeing (*Al Mutair, Alhajji & Shamsan, 2021*). Similar concerns and fears about transmitting the virus to their families were reported among healthcare providers during the severe acute respiratory syndrome (SARS) outbreak in 2003 (*Al Mutair, Alhajji & Shamsan, 2021*). Cultural norms and differences in living conditions among Saudi and non-Saudi healthcare providers may contribute to higher anxiety levels. In terms of sleeping disorders, this study found that healthcare providers who had sleeping disorders before COVID-19 exhibited higher anxiety (8.98 ± 5.32) compared to those who did not have sleeping disorders (7.04 ± 5.51) ($X^2 = 12.127$, $df = 2$, $p < 0.05$). This is important because a systematic review and meta-analysis found that the prevalence of sleep disturbances during COVID-19 was approximately 34.8% among nurses in six of the reviewed studies and 41.6% among physicians in four of the studies reviewed (*Maunder et al., 2003*). Previous studies found that sleeping disorders among healthcare providers were associated with an 83% event of adverse safety outcomes, such as motor vehicle crashes, exposure to potentially infectious materials, and medical errors (*Salari et al., 2020; Weaver et al., 2018*). Moreover, screening positive for anxiety or depression increased the risk of adverse safety outcomes by 63% (*Al Mutair et al., 2019; Bové et al., 2014*). Anxiety among healthcare providers accompanied by sleeping disorders during the pandemic crisis may interfere with physical, mental, and emotional functioning, and result in adverse occupational safety outcomes. Possible limitations of this study include its cross-sectional design, as casual inferences should not be made. The limitations also relate to the GAD-7 scale, as it screens for an anxiety disorder and provides a probable diagnosis that must be confirmed with a physical examination or blood tests to rule out thyroid dysfunction (*Al Mutair et al., 2020c; Brandt et al., 2014*). Since recruitments were made *via* questionnaire, healthcare providers who responded may be more self-aware and interested in revealing their concerns. This study represented Saudi and non-Saudi healthcare providers, so there may be cultural norms and differences in living conditions that might have affected our findings. Future research may use a longitudinal study design to understand the pattern of the levels of anxiety among healthcare providers over time during the COVID-19 pandemic. In addition, further research may use a mixed-method

design that allows qualitative and quantitative data integration, thus providing a broader, in-depth knowledge of the effect of COVID-19 on anxiety levels among healthcare providers. Future studies may also compare the effects of COVID-19 on anxiety levels among Saudi and non-Saudi healthcare providers.

CONCLUSION

In conclusion, this Saudi-based study identified that healthcare providers' overall generalized anxiety disorder during the COVID-19 pandemic was classified as mild. Results showed that the 31–40 age group, healthcare providers other than nurses and physicians, Saudi nationality, and healthcare providers with sleeping disorders before COVID-19 were associated with anxiety levels. Several factors might contribute to higher anxiety levels among Saudi healthcare providers: such as marital status, socioeconomic status, having a chronic health condition, fear of contracting the virus, or living with a person at high risk for severe illness. To further understand the level of anxiety among healthcare providers during the COVID-19 pandemic in Saudi Arabia, longitudinal and mixed-method research is needed. When these factors were examined simultaneously, study found that gender, nationality, and sleeping disorder before Covid-19 are the main significant factors for anxiety levels. It was found that being a female, Saudi nationality, and having sleeping disorder before Covid-19 greatly increase the odds of having higher level of anxiety.

Consent for publication

Participation in the study was voluntary and participants were ensured that information gathered for the study would be kept confidential and will be used for the study purposes only.

LIST OF ABBREVIATIONS

COVID-19	Coronavirus Disease 2019
SARS-CoV-2	Severe acute respiratory syndrome coronavirus 2
GAD	Generalized anxiety disorder
WHO	World Health Organization
IRB	Institutional Review Board
HCWs	Health care works
SPSS	Statistical Package for the Social Sciences
SD	Standard deviation
IQR	Interquartile range
SDS	Self-Rating Depression Scale

ACKNOWLEDGEMENTS

The authors declare no conflict of interest in preparing this article, authors thank the referee for constructive comments.

ADDITIONAL INFORMATION AND DECLARATIONS

Funding

The authors received no funding for this work.

Competing Interests

Abbas Al Mutair and Abbas Shamsan were employed by the Dr. Sulaiman Al Habib Medical Group. The other authors declare that they have no competing interests.

Author Contributions

- Abbas Al Mutair conceived and designed the experiments, performed the experiments, authored or reviewed drafts of the paper, and approved the final draft.
- Alya Al Mutairi conceived and designed the experiments, analyzed the data, prepared figures and/or tables, and approved the final draft.
- Yasmine Alabbasi conceived and designed the experiments, authored or reviewed drafts of the paper, and approved the final draft.
- Abbas Shamsan conceived and designed the experiments, authored or reviewed drafts of the paper, and approved the final draft.
- Sana Al-Mahmoud conceived and designed the experiments, prepared figures and/or tables, authored or reviewed drafts of the paper, and approved the final draft.
- Saad Alhumaid performed the experiments, authored or reviewed drafts of the paper, and approved the final draft.
- Muhammad Zeshan Arshad analyzed the data, prepared figures and/or tables, and approved the final draft.
- Mansour Awad performed the experiments, prepared figures and/or tables, and approved the final draft.
- Ali Rabaan conceived and designed the experiments, prepared figures and/or tables, and approved the final draft.

Ethics

The following information was supplied relating to ethical approvals (*i.e.*, approving body and any reference numbers):

The Institutional Review Board at Dr. Sulaiman Al Habib Medical Group approved this research (IRB Log No. RC20.06.88-03).

Data Availability

The following information was supplied regarding data availability:

Raw data are available as a [Supplementary File](#).

Supplemental Information

Supplemental information for this article can be found online at <http://dx.doi.org/10.7717/peerj.12119#supplemental-information>.

REFERENCES

- Al Mutair A, Al Mohaini M, Fernandez R, Moxham L, Lapkin S, Ham-Baloyi WT. 2018.** Psychometric testing of the mental health inventory in an Arabian context: Cross-cultural validation study. *Nursing open* 5(3):376–383 DOI 10.1002/nop2.149.
- Al Mutair A, Al Mutairi A, Ambani Z, Shamsan A, AlMahmoud S, Alhumaid S. 2021.** The impact of COVID-19 pandemic on the level of depression among health care workers: cross-sectional study. *PeerJ* 9:e11469 DOI 10.7717/peerj.11469.
- Al Mutair A, Al Mutairi A, Chagla H, Alawam K, Als Salman K, Ali A. 2020a.** Examining and adapting the psychometric properties of the Maslach burnout inventory-health services survey (MBI-HSS) among healthcare professionals. *Applied Sciences* 10(5):1890 DOI 10.3390/app10051890.
- Al Mutair A, Al Obaidan F, Al-Muhaini M, Al Salman K, Al Mosajen S. 2017.** Cross-sectional study of the overall emotional functioning of health-care providers in Saudi. *Saudi Critical Care Journal* 1(3):80 DOI 10.4103/sccj.sccj_2_18.
- Al Mutair A, Alhajji M, Shamsan A. 2021.** Emotional wellbeing in Saudi Arabia during the COVID-19 pandemic: a national survey. *Risk Management and Healthcare Policy* 14:1065–1072 DOI 10.2147/RMHP.S279716.
- Al Mutair A, Alhumaid S, Alhuqbani WN, Zaidi, Alkoraisi S, Al-Subaie MF, AlHindi AM, Abogosh AK, Alrasheed AK, Alsharafi AA, Alhuqbani MN, Alhowar NA, Salih S, Alhedaithy MA, Al-Tawfiq JA, Al-Shammari H, Abdulqawi R, Ismail AF, Hamdan N, Saad F, Olhaye FA, Eltahir TA, Rabaan AA, Al-Omari A. 2020b.** Clinical, epidemiological, and laboratory characteristics of mild-to-moderate COVID-19 patients in Saudi Arabia: an observational cohort study. *European Journal of Medical Research* 25(1):1–8.
- Al Mutair A, Ambani Z. 2020.** Narrative review of Middle East respiratory syndrome coronavirus (MERS-CoV) infection: updates and implications for practice. *Journal of International Medical Research* 48(1):0300060519858030 DOI 10.1177/0300060519858030.
- Al Mutair A, Shamsan A, AlFaqiri A, Al-Omari A. 2019.** Intensive care unit patients' perception of sleep quality and factors of sleep disruption: cross-sectional study. *Dr. Sulaiman Al Habib Medical Journal* 1(1):30–35 DOI 10.2991/dsahmj.k.190530.001.
- Al Mutair A, Shamsan A, Salih S, Al-Omari A. 2020c.** Sleep deprivation etiologies among patients in the intensive care unit: literature review. *Dimensions of Critical Care Nursing* 39(4):203–210 DOI 10.1097/DCC.0000000000000422.
- Al-Omari A, Al Mutair A, Shamsan A, Al Mutairi A. 2020a.** Predicting burnout factors among healthcare providers at private hospitals in Saudi Arabia and United Arab Emirates: A cross-sectional study. *Applied Sciences* 10(1):157 DOI 10.3390/app10010157.
- Al-Omari A, Alhuqbani WN, Zaidi ARZ, Al-Subaie MF, AlHindi AM, Abogosh AK, Alrasheed AK, Alsharafi AA, Alhuqbani MN, Salih S, Alhedaithy MA, Abdulqawi R, Ismail AF, Alhumaid S, Hamdan N, Saad F, Olhaye FA, Eltahir TA, Alomari M, Alshehery M, Yassiri A, Al-Tawfiq JA, Al Mutair A. 2020b.** Clinical characteristics of non-intensive care unit COVID-19 patients in Saudi Arabia: a descriptive cross-sectional study. *Journal of Infection and Public Health* 13(11):1639–1644 DOI 10.1016/j.jiph.2020.09.003.
- AlAteeq DA, Aljhani S, Althiyabi I, Majzoub S. 2020.** Mental health among healthcare providers during coronavirus disease (COVID-19) outbreak in Saudi Arabia. *Journal of Infection and Public Health* 13(10):1432–1437 DOI 10.1016/j.jiph.2020.08.013.
- Alenazi TH, BinDhim NF, Alenazi MH, Tamim H, Almagrabi RS, Aljohani SM, H Basyouni M, Almubark RA, Althumiri NA, Alqahtani SA. 2020.** Prevalence and predictors of anxiety

- among healthcare workers in Saudi Arabia during the COVID-19 pandemic. *Journal of Infection and Public Health* **13**(11):1645–1651 DOI 10.1016/j.jiph.2020.09.001.
- American Psychological Association. 2021.** Anxiety. Available at <https://www.apa.org/topics/anxiety#:~:text=Anxiety%20is%20an%20emotion%20characterized,certain%20situations%20out%20of%20worry> (accessed 15 March 2021).
- Bové KB, Watt T, Vogel A, Hegedüs L, Bjoerner JB, Groenvold M, Bonnema SJ, Rasmussen Åse K, Feldt-Rasmussen U. 2014.** Anxiety and depression are more prevalent in patients with Graves' disease than in patients with nodular goitre. *European Thyroid Journal* **3**(3):173–178.
- Brandt F, Thvilum M, Almind D, Christensen K, Green A, Hegedüs L, Brix TH. 2014.** Hyperthyroidism and psychiatric morbidity: evidence from a Danish nationwide register study. *European Journal of Endocrinology* **170**(2):341–348 DOI 10.1530/EJE-13-0708.
- Chirico F, Ferrari G, Nucera G, Szarpak L, Crescenzo P, Ilesanmi O. 2021.** Prevalence of anxiety, depression, burnout syndrome, and mental health disorders among healthcare workers during the COVID-19 pandemic: a rapid umbrella review of systematic reviews. *Journal of Health and Social Sciences* **6**(2):209–220.
- Chirico F, Magnavita N. 2020.** The crucial role of occupational health surveillance for health-care workers during the COVID-19 pandemic. *Workplace Health & Safety* **69**(1):5–6 DOI 10.1177/2165079920950161.
- Chirico F, Nucera G. 2020.** Tribute to healthcare operators threatened by COVID-19 pandemic. *Journal of Health and Social Sciences* **5**(2):165–168.
- De Kock JH, Latham HA, Leslie SJ, Grindle M, Munoz SA, Polson R, O'Malley CM. 2021.** A rapid review of the impact of COVID-19 on the mental health of healthcare workers: implications for supporting psychological well-being. *BMC Public Health* **21**(1):1–18.
- Fernandez R, Ten Ham-Baloyi W, Al Mutair A, Lapkin S, Moxham L, Tapsell A. 2020.** Similarities and differences in well-being between Australian, Saudi Arabian and South African pre-registration nursing students. *Collegian* **27**(4):416–421 DOI 10.1016/j.colegn.2019.11.001.
- Lai J, Ma S, Wang Y, Cai Z, Hu J, Wei N, Wu J, Du H, Chen T, Li R, Tan H, Kang L, Yao L, Huang M, Wang H, Wang G, Liu Z, Hu S. 2020.** Factors associated with mental health outcomes among health care workers exposed to coronavirus disease 2019. *JAMA network open* **3**(3):e203976 DOI 10.1001/jamanetworkopen.2020.3976.
- Lehmann M, Bruenahl CA, Löwe B, Addo MM, Schmiedel S, Lohse AW, Schramm C. 2015.** Ebola and psychological stress of health care professionals. *Emerging Infectious Diseases* **21**(5):913–914 DOI 10.3201/eid2105.141988.
- Lin CY, Peng YC, Wu YH, Chang J, Chan CH, Yang DY. 2007.** The psychological effect of severe acute respiratory syndrome on emergency department staff. *Emergency Medicine Journal* **24**(1):12–17 DOI 10.1136/emj.2006.035089.
- Magnavita N, Chirico F, Garbarino S, Bragazzi NL, Santacroce E, Zaffina S. 2021.** SARS/MERS/ SARS-CoV-2 outbreaks and Burnout Syndrome among healthcare workers—an umbrella systematic review. *International Journal of Environmental Research and Public Health* **18**(8):4361 DOI 10.3390/ijerph18084361.
- Maunder R, Hunter J, Vincent L, Bennett J, Peladeau N, Leszcz M, Sadavoy J, Verhaeghe LM, Steinberg R, Mazzulli T. 2003.** The immediate psychological and occupational impact of the 2003 SARS outbreak in a teaching hospital. *CMAJ* **168**(10):1245–1251.
- Mental Health America. 2020.** The mental health of healthcare workers in COVID-19. Available at [https://mhanational.org/mental-health-healthcare-workers-covid-19#:~:text=The%](https://mhanational.org/mental-health-healthcare-workers-covid-19#:~:text=The%20)

20responses%20collected%20from%20the,75%25%20said%20they%20were%20overwhelmed (accessed 1 April 2021).

- Ministry of Health.** 2020. MOH news. Available at <https://www.moh.gov.sa/en/Ministry/MediaCenter/News/Pages/News-2020-03-02-002.aspx> (accessed 15 March 2021).
- Pappa S, Ntella V, Giannakas T, Giannakoulis VG, Papoutsis E, Katsaounou P.** 2020. Prevalence of depression, anxiety, and insomnia among healthcare workers during the COVID-19 pandemic: a systematic review and meta-analysis. *Brain, Behavior, and Immunity* **88(20)**:901–907 DOI [10.1016/j.bbi.2020.05.026](https://doi.org/10.1016/j.bbi.2020.05.026).
- Rutter LA, Brown TA.** 2017. Psychometric properties of the generalized anxiety disorder scale-7 (GAD-7) in outpatients with anxiety and mood disorders. *Journal of Psychopathology and Behavioral Assessment* **39(1)**:140–146 DOI [10.1007/s10862-016-9571-9](https://doi.org/10.1007/s10862-016-9571-9).
- Salari N, Hosseinian-Far A, Jalali R, Vaisi-Raygani A, Rasoulpoor S, Mohammadi M, Rasoulpoor S, Khaledi-Paveh B.** 2020. Prevalence of stress, anxiety, depression among the general population during the COVID-19 pandemic: a systematic review and meta-analysis. *Globalization and Health* **16(1)**:1–11.
- Spitzer RL, Kroenke K, Williams JB, Löwe B.** 2006. A brief measure for assessing generalized anxiety disorder: the GAD-7. *Archives of Internal Medicine* **166(10)**:1092–1097 DOI [10.1001/archinte.166.10.1092](https://doi.org/10.1001/archinte.166.10.1092).
- Wang C, Pan R, Wan X, Tan Y, Xu L, Ho CS, Ho RC.** 2020. Immediate psychological responses and associated factors during the initial stage of the 2019 coronavirus disease (COVID-19) epidemic among the general population in China. *International Journal of Environmental Research and Public Health* **17(5)**:1729 DOI [10.3390/ijerph17051729](https://doi.org/10.3390/ijerph17051729).
- Weaver MD, Vetter C, Rajaratnam SMW, O'Brien CS, Qadri S, Benca RM, Rogers AE, Leary EB, Walsh JK, Czeisler CA, Barger LK.** 2018. Sleep disorders, depression and anxiety are associated with adverse safety outcomes in healthcare workers: a prospective cohort study. *Journal of Sleep Research* **27(6)**:e12722 DOI [10.1111/jsr.12722](https://doi.org/10.1111/jsr.12722).
- World Health Organization.** 2021. Mental health and COVID-19. Available at <https://www.euro.who.int/en/health-topics/health-emergencies/coronavirus-covid-19/publications-and-technical-guidance/noncommunicable-diseases/mental-health-and-covid-19> (accessed 14 March 2021).
- Zhang Y, Ma ZF.** 2020. Impact of the COVID-19 pandemic on mental health and quality of life among local residents in Liaoning Province, China: a cross-sectional study. *International Journal of Environmental Research and Public Health* **17(7)**:2381 DOI [10.3390/ijerph17072381](https://doi.org/10.3390/ijerph17072381).