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Research Article

Anxiety and Depression Among Sudanese Nurses During the COVID-19 Pandemic: A Cross-sectional Study

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Editor-in-Chief:
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Abstract

Background: While treating patients during a pandemic, nurses are at risk of mental health issues caused by the stress they face. This study aimed to examine the degree of anxiety and depression among Sudanese nurses throughout the coronavirus disease 2019 (COVID-19) pandemic and demographic features and their association with depression and anxiety.

Methods: An online-based cross-sectional study was conducted on Sudanese nurses. Data were collected from eligible nurses using a three-part questionnaire: demographic questions, the generalized anxiety disorder-7 (GAD-7), and the major depression index (MDI). We used the Chi-square test and Spearman or point biserial correlation to assess the association between demographics, anxiety, and depression.

Results: Two hundred and forty-six nurses from Sudan participated in this study. Around 69.5% of participants experienced mild to severe anxiety, while 26.4% revealed mild to severe depression. We found a significant association between depression and anxiety ($P < 0.001$). However, we did not find a significant association between depression or anxiety categories and the baseline characteristics of participants.

Conclusion: Our study demonstrates high rates of anxiety and depression among Sudanese nurses throughout the COVID-19 pandemic. As we found no association between anxiety and depression with personal characteristics, psychological support should be given to all nurses' categories as all of them nearly have the same risk for anxiety and depression.

1. Introduction

Coronaviruses are RNA viruses that trigger respiratory, gastrointestinal, hepatic, and neurological disorders in humans and other mammals. Six distinct coronavirus species can cause human illness. It is typical for four viruses to induce common cold symptoms in immunocompetent people: 229E (OC43), NL63 (HKU1), and NL63 (OC43) [1]Click or tap here to enter text.. The two other viruses, SARS-CoV and MERS-CoV, have been linked to deadly illnesses in humans [2]Click or tap here to enter text.. There were two epidemics of severe acute respiratory syndrome in Guangdong Province, China, caused by SARS-CoV. The MERS-CoV was the cause of the Middle Eastern epidemics of severe respiratory illness in 2012 [3]Click or tap here to enter text.. New coronaviruses are expected to evolve regularly because of their high prevalence, widespread dispersion, and tremendous genetic shifting. Many regional health facilities in Wuhan, Hubei Province, have reported groups of pneumonia patients with an unknown etiology in late December 2019 [4]Click or tap here to enter text..

The Chinese Center for Disease Control and Prevention (China CDC), Hubei Province, and Wuhan Municipal Health officials conducted an epidemiologic and etiologic investigation on December 31, 2019 [4]. The newly discovered coronavirus was declared a pandemic under the International Health Regulation by the World Health Organization (WHO) on January 30, 2020. The pandemic death rates have been enormous, with psychological and emotional implications for the rest of the world. On May 30, 2020, 5,819,962 cases were diagnosed as COVID-19 with 362,786 deaths worldwide [5]. On February 15, 2022, Sudan recorded a total of 59,631 COVID-19 cases, of which 3,831 were deaths [6]. Moreover, number of laboratories were increased in order to cope with COVID-19 testing. In addition, Sudan's Infection Prevention and Control program ensured that all patients seeking treatment for acute respiratory ailments were thoroughly tested [6, 7]Click or tap here to enter text..

People of many ages and backgrounds have been affected by the pandemic, from healthy people to those at risk. In hospitals and isolation units, nurses can suffer from mass panic, depression, and anxiety because of the widespread quarantine [8]Click or tap here to enter text.. They have direct contact with coronavirus patients confirmed or suspected, apart from these the increase in workload, infection risk, and mental health difficulties are all challenges they must deal with [9].

The COVID-19 pandemic has exacerbated nurses' worry, terror, panic attacks, post-traumatic stress, and psychological disturbances, as well as their contact avoidance, depressive tendencies, sleep difficulties, and anxieties about infecting their loved ones.

Although mental and psychosocial illnesses are common in nurses, many do not get regular mental health support [10]Click or tap here to enter text.. This may lead to increased medical errors and accidents that put patients at risk due to nurses' mental health difficulties that would affect their cognitive functions, attention, and clinical decision-making [11]Click or tap here to enter text..

The SARS outbreak in 2003 had a severe psychological impact on nurses [12]. These nurses were afraid of catching the disease and spreading it to their families and coworkers, with many having the desire to leave their jobs. There was also a greater prevalence of feelings of anxiety, stress, and depression, all of which have the potential to have long-term effects on mental health [13, 14]. Psychological services have been widely deployed in response to the COVID-19 pandemic, including phone, internet, and application-based intervention. On February 2, 2020, China's State Council announced the establishment of national hotlines for psychological assistance during the outbreak. On the other hand, nurses had very few options for their mental health treatment [15]. Nonetheless, it is essential to address healthcare workers' mental health problems to combat the pandemic better [16]Click or tap here to enter text..

Therefore, we aimed to assess depression and anxiety among Sudanese nurses during the COVID-19 pandemic by quantifying the severity of depression and anxiety, their relationship to demographic variables, and their relationship to each other.

2. Materials and Methods

2.1. Study design

An online-based cross-sectional study to evaluate depression and anxiety and their factors among nurses fronting the COVID-19 pandemic in Sudan.

2.2. Sampling

We used the convenience sampling method to collect data from eligible nurses. With a confidence interval level of 95% and a margin of error of 5%, Epi Info V.7 was used to calculate the sample size based on the prevalence of anxiety (20.2, 90.5) and depression (12.7%, 94.1) [17, 18]Click or tap here to enter text.. According to health officials, the total number of nurses is nearly 6000. Therefore, the sample size was calculated to be 238, 166, 130, or 86 participants.

2.3. Measurements

Three parts self-administered questionnaire was used to collect the data: a demographic part, the generalized anxiety disorder (GAD-7) part, and the Major Depression Index (MDI) part. Demographic questions asked about the respondent's age, gender, marital status, place of employment (department), degree of education, and years of experience.

Anxiety in the study individuals was measured using the GAD-7 questionnaire. The early version of the GAD questionnaire included 13-items was first used in the years 2004 and 2005; 2740 adult patients in 15 clinics across the United States completed the initial 13-item version of the GAD questionnaire. Seven of these items were recommended for inclusion in the final edition. The initial investigation results show that this tool is reliable and valid. Each question was answered by one of these answers: not at all (0), several days (1), more than half the days (2), or nearly every day (3). A score of 5-9 indicates mild anxiety, 10-14 of moderate anxiety, and more than 15 indicates severe anxiety [19-20]Click or tap here to enter text..

MDI is a self-rating depression scale that has been clinically verified and is used in epidemiological studies [21, 22]Click or tap here to enter text. with 10 items taken directly from the 10th version of the International Classification of Diseases (ICD) list of depressive symptoms. Each question was answered by one of the following answers: at no time (0), some of the time (1), slightly less than half the time (2), slightly more than half the time (3), most of the time (4), or all the time (5). According to the participants' answers, we categorized them into four categories: no depression (<20), mild depression (20-24), moderate depression (25-29), or severe depression (≥30) [23]Click or tap here to enter text..

2.4. Statistical analysis

The continuous variables were checked using the Kolmogorov-Smirnov test to test their normality. Continuous variables were described as median and range, whereas categorical data were expressed as frequency and percentage. The association between different baseline categories, anxiety, and depression were tested using the Chi-square test, Spearman correlation, and point biserial correlation; P-value >0.05 was statistically significant, and data were analyzed with SPSS version 25 [24]Click or tap here to enter text..

3. Results

3.1. Demographic characteristics

Two hundred and forty-six nurses participated in this study, of which 86 (35%) aged between 24 and 29 years old, and 74 (30.1%) were between 30 and 35 years old. Most nurses were females, 164 (66.7 %), of which 149 had bachelor's degrees 149 (60.6 %). Fifty-six nurses (22.6 %) had 10 or more years of experience, and 82 (33.3 %) nurses had only three years of experience. Detailed characteristics of the participants are presented in Table 1.

3.2. Anxiety levels among participants

Regarding anxiety assessed by GAD 7 questionnaire, 75 nurses (30.5 %) had no anxiety, 83 nurses (33.7 %) had mild anxiety, 64 nurses (26 %) had moderate anxiety, and 24 nurses (9.8 %) had severe anxiety. The median anxiety score was seven, and the range was (0-21). The full detailed answer to the seven questions is shown in Table 2.

3.3. Depression levels among participants

Depression among nurses was assessed using MDI. It showed that 181 nurses (73.6%) had no depression, 20 (8.1%) had mild depression, 14 (5.7 %) had moderate depression, and 31(12.6%) had severe depression. The median depression score was 12, and the range was (0-55). The full detailed answer to the questions is shown in Table 3.

3.4. Association and correlation between anxiety and demographics

We found no significant association or correlation between anxiety score or categories and the following baseline characteristics: age, sex, marital status, education level, department, and years of experience with P values of 0.069, 0.19, 0.52, 0.4, 0.97, and 0.15 respectively (Table 4, Supplementary Table 1).

3.5. Association between depression and demographics

We also analyzed the association between depression categories and baseline characteristics. No significant association or correlation was observed between depression

TABLE 1: General demographics.

Characteristics	N (%)*a
Age, yr	
18–23	32 (13)
24–29	86 (35)
30–35	74 (30.1)
36–41	39 (15.9)
41 and above	15 (6.1)
Sex	
Male	82 (33.3)
Female	164 (66.7)
Marital status	
Married	118 (48)
Divorced	7 (2.8)
Single	119 (48.4)
Widowed	2 (0.8)
Education level	
Bachelor	149 (60.6)
Diploma	20 (8.1)
Master	63 (25.6)
PhD	14 (5.7)
Department	
Blood bank	1 (0.4)
Cardiac department	14 (5.7)
Critical care unit (CCU)	12 (4.9)
Diabetic specialist center	1 (0.4)
Dialysis unit	15 (6.1)
Educator	1 (0.4)
Emergency unit	28 (11.4)
Endoscopy	1 (0.4)
Field clinic	1 (0.4)
General ward	42 (17.1)
Head nurse	1 (0.4)
Intensive care unit (ICU)	62 (25.2)
Maternity and childbirth ward	8 (3.3)
Mental health department	7 (2.8)
Neonatal intensive care unit (NICU)	1 (0.4)
Newborn unit	17 (6.9)
Nursing administration	2 (0.8)
Obstetric department	1 (0.4)

score or categories and the following baseline characteristics: age, sex, marital status,

TABLE 1: General demographics.

Characteristics	N (%)^{*a}
Oncology and Cancer unit	2 (0.8)
OPD	1 (0.4)
Operations department	17 (6.9)
Orthopedic ward	5 (2)
Pediatric intensive care unit (PICU)	1 (0.4)
Professor	4 (1.6)
Respiratory department	1 (0.4)
Years of experience, yr	
3	82 (33.3)
4–6	79 (32.1)
4–9	29 (11.8)
10 or more	56 (22.8)

^{*a}Valid percent was used if there were any missing data.

education level, department, and years of experience with *P* values of 0.42, 0.52, 0.95, 0.99, 0.61, and 0.43

3.6. Association between anxiety and depression

Our study found a significantly moderate correlation between anxiety and depression scores in the case of depression or anxiety, defined as an outcome variable. The R-value was 0.576, and the p-value was> 0.0001 (Tables 4 and 5).

4. Discussion

Anxiety and depression among Sudanese nurses during the COVID-19 pandemic were the key point of our study, which aimed to determine their prevalence and correlate it with various demographic variables.

According to the GAD-7 questionnaire, the median anxiety score among nurses in our study was 7, and around 69.5% of participants experienced mild to severe anxiety levels. According to Margaretha *et al*., 33.3% of healthcare practitioners reported experiencing anxiety during the COVID-19 crisis [25]Click or tap here to enter text.. According to a comprehensive study conducted during the COVID-19 pandemic, 23.2% of healthcare providers (HCPs) exhibited anxiety symptoms [26]Click or tap here to enter

TABLE 2: GAD-7 questions for anxiety.

Characteristics	N (%)^{*a}
Feeling nervous, anxious, or on edge?	
Not at all	67 (27.2)
Several days	81 (32.9)
More than half the days	61 (24.8)
Nearly every day	37 (15)
Not being able to stop or control worrying?	
Not at all	85 (34.6)
Several days	88 (35.8)
More than half the days	43 (17.5)
Nearly every day	30 (12.2)
Worrying too much about different things?	
Not at all	77 (31.3)
Several days	84 (34.1)
More than half the days	48 (19.5)
Nearly every day	37 (15)
Trouble relaxing?	
Not at all	82 (33.3)
Several days	88 (35.8)
More than half the days	52 (20.3)
Nearly every day	26 (10.6)
Being so restless that it is hard to sit still?	
Not at all	98 (39.8)
Several days	76 (30.9)
More than half the days	42 (17.1)
Nearly every day	30 (12.2)
Becoming easily annoyed or irritable?	
Not at all	99 (40.2)
Several days	82 (33.3)
More than half the days	34 (13.8)
Nearly every day	31 (12.6)
Feeling afraid as if something awful might happen?	
Not at all	71 (28.9)
Several days	96 (39)
More than half the days	43 (17.5)
Nearly every day	36 (14.6)
Anxiety severity	
No anxiety	75 (30.5)
Mild anxiety	83 (33.7)
Moderate anxiety	64 (26)
Severe anxiety	24 (9.8)
Anxiety score	7 (0-21)^{*b}
^{*a}Valid percent was used if there were any missing data.	
^{*b}Data is presented as median (range).	

TABLE 3: MDI questions for depression.

Characteristics	N (%)*a
1. Felt low in spirits or sad?	
At no time	58 (23.6)
Some of the time	99 (40.2)
Slightly less than half the time	33 (13.4)
Slightly more than half the time	28 (11.4)
Most of the time	12 (4.9)
All the time	16 (6.5)
2. Lost interest in daily activities?	
At no time	48 (19.5)
Some of the time	99 (40.2)
Slightly less than half the time	37 (15)
Slightly more than half the time	27 (11)
Most of the time	15 (6.1)
All the time	20 (8.1)
3. Feeling lack in energy and strength?	
At no time	93 (37.8)
Some of the time	73 (29.7)
Slightly less than half the time	36 (14.6)
Slightly more than half the time	15 (6.1)
Most of the time	15 (6.1)
All the time	14 (5.7)
4. Felt less confident?	
At no time	98 (39.8)
Some of the time	64 (26)
Slightly less than half the time	45 (18.3)
Slightly more than half the time	17 (6.9)
Most of the time	12 (4.9)
All the time	10 (4.1)
5. Had a bad conscience or feelings of guilt?	
At no time	98 (39.8)
Some of the time	64 (26)
Slightly less than half the time	45 (18.3)
Slightly more than half the time	17 (6.9)
Most of the time	12 (4.9)
All the time	10 (4.1)

text.. According to an online study, 90.5% of Egyptian HCPs exposed to the COVID-19 pandemic displayed varying levels of anxiety [18].Click or tap here to enter text. The inconsistencies could be explained by variations in anxiety levels in samples and working conditions between the two studies. As many as 70% of those who participated

TABLE 3: MDI questions for depression.

Characteristics	N (%)*a
6. Felt that life was not worth living?	
At no time	105 (42.7)
Some of the time	71 (28.9)
Slightly less than half the time	29 (11.8)
Slightly more than half the time	23 (9.3)
Most of the time	10 (4.1)
All the time	8 (3.3)
7. Had difficulty in concentrating, e.g. when reading the newspaper or watching television?	
At no time	80 (32.5)
Some of the time	83 (33.7)
Slightly less than half the time	39 (15.9)
Slightly more than half the time	20 (8.1)
Most of the time	16 (6.5)
All the time	8 (3.3)
8a. Felt very restless?	
At no time	68 (27.6)
Some of the time	85 (34.6)
Slightly less than half the time	45 (18.3)
Slightly more than half the time	24 (9.8)
Most of the time	15 (6.1)
All the time	9 (3.7)
8b. Felt subdued or slowed down?	
At no time	81 (32.9)
Some of the time	82 (3.3)
Slightly less than half the time	44 (17.9)
Slightly more than half the time	22 (8.9)
Most of the time	10 (4.1)
All the time	7 (2.8)
9. Had trouble sleeping at night?	
At no time	70 (28.5)
Some of the time	82 (33.3)
Slightly less than half the time	38 (15.4)
Slightly more than half the time	27 (11)
Most of the time	14 (5.7)
All the time	15 (6.1)

in the Egyptian study were doctors and nurses. Egypt has a shortage of doctors of 0.5 per 1000 people, as reported by the World Bank [18]Click or tap here to enter text., and a shortage of nurses of 1.9 per 1000 people. A high workload was observed, during the COVID-19 epidemic, due to a lack of staff, which eventually increased the anxiety

TABLE 3: MDI questions for depression.

Characteristics	N (%)*ᵃ
10a. Suffered from reduced appetite	
At no time	75 (30.5)
Some of the time	84 (34.1)
Slightly less than half the time	42 (17.1)
Slightly more than half the time	18 (7.3)
Most of the time	17 (6.9)
All the time	10 (4.1)
10b. Suffered from increased appetite?	
At no time	105 (42.7)
Some of the time	71 (28.9)
Slightly less than half the time	27 (11)
Slightly more than half the time	19 (7.7)
Most of the time	12 (4.9)
All the time	12 (4.9)
Depression severity	
No depression	181 (73.6)
Mild depression	20 (8.1)
Moderate depression	14 (5.7)
Severe depression	31 (12.6)
Depression score	12 (0-55)*ᵇ
*ᵃValid percent was used if there were any missing data.	
*ᵇ Data were presented as median (range)	

TABLE 4: Correlation between anxiety score and baseline characteristics.

	Age	Sex	Marital status	Education level	Department	Years of experience	Depression score
R	−0.116	0.083	−0.041	−0.051	0.002	−0.092	0.576
P-value	0.069	0.193	0.521	0.427	0.974	0.152	>0.0001
Number	246	246	246	246	246	246	246

TABLE 5: Correlation between depression score and baseline characteristics.

	Age	Sex	Marital status	Education level	Department	Years of experience	Anxiety score
R	−0.052	0.041	0.004	0.001	−0.032	−0.050	0.576
P-value	0.417	0.524	0.946	0.989	0.613	0.435	>0.0001
Number	246	246	246	246	246	246	246

respectively (Table 5, Supplementary Table 2).

symptoms [27, 28]. Lack of personal protective measures and other essential equipment during the initial phases of COVID-19 pandemic- might have led to HCP concerns. HCPs

can be protected from the psychological effects of the COVID-19 pandemic if they have sufficient staff and personal protective equipment.

In our study, 26.4% of nurses showed signs of depression. While in Motahedi *et al.*'s study, 57% of the participants reported being depressed at some point [29]. About 40-45% of the frontline nurses surveyed in Wuhan reported experiencing anxiety or depression, with about 11-14% of those experiencing moderate to severe anxiety or sadness. Bannai *et al.* found that 22.8% of HCPs reported depression symptoms during COVID-19. More than 94% of HCPs reported mild to severe depression throughout the pandemic of COVID-19 [18]; according to Aly *et al.*, anxiety and depression have been linked to long work hours [30]. It can be concluded that longer working hours cause an increased prevalence of anxiety and depression [18].

In our study, anxiety and depression were revealed to be directly linked. The similar pathophysiology of anxiety and depression shows that the two illnesses may co-occur, even though they are clinically separate [31]. In addition, prior studies have indicated that depression and anxiety are linked. A correlation between sadness and anxiety has been found among Italian healthcare workers. HCPs were also more likely to be affected by anxiety and depression during the outbreaks of diseases such as SARS or Ebola [32]Click or tap here to enter text..

Anxiety and depression were not significantly associated with any of the demographic factors that we looked for in our research. This was also found in Egypt in an online cross-sectional study. The difference was not statistically significant when the study participants were compared by age and gender to the frequency of their reported stress, anxiety, and depression. On the other hand, a prior study indicated that female HCPs had higher anxiety levels than their male counterparts [29]. Female healthcare workers were more anxious during the COVID-19 epidemic in other Iranian studies [28, 33]. These studies suggest this association could be explained by the vulnerability of females to a variety of stresses, including difficulty in managing work and personal life as well as the lack of proper support; as a result, it was predicted that their psychological distress would rise during the COVID-19 pandemic [34]Click or tap here to enter text.. Also, gender disparity in depression and anxiety may be attributable to women's historically more candid responses to anxiety-related questions [35]Click or tap here to enter text.. Memory, understanding, and reporting of experiences varied between men and women [36]Click or tap here to enter text..

A pandemic significantly strains a country's political, economic, and healthcare systems. According to the WHO study, 93% of nations around the globe , had restrictions on access to mental health care during the COVID-19 era. However, owing to

the catastrophic consequences of this condition on mental health, immediate access to psychological treatments is required [37]Click or tap here to enter text.. Limited resources during the pandemic, necessitates careful planning, also there are other ways to provide prompt psychological help, including informal networks of support and telemedicine [38]Click or tap here to enter text..

Our study has some limitations as it was conducted online, and some nurses who were unavailable or not interested in social media throughout the study period may have missed it, which may increase the risk of selection bias due to the web-based survey. In addition, baseline anxiety and depression scores could not be assessed and adjusted as a confounder for participants because of the abrupt beginning of the pandemic. Also, cross-sectional studies could not establish causality.

5. Conclusion

Our study demonstrates high rates of anxiety and depression among Sudanese nurses throughout the COVID-19 pandemic. As we found no association between anxiety and depression with personal characteristics, psychological support should be given to all nurses' categories as all of them nearly have the same risk for anxiety and depression.

Acknowledgments

Ethical Consideration

Ethics concerns included the following: 1) The first sentence in the online survey was a check box representing the participant's agreement to continue the survey with acceptance of the survey's ethical consideration. 2) The data was saved strictly confidential for research purposes. 3) The participants were made aware that their participation was completely voluntary and could choose not to participate for any reason. 4) There was no disruption in workflow due to this study's objectives.

Competing Interests

In this study, all authors have no conflicts of financial or personal interest to declare.

Availability of Data and Material

All data for this study that were generated and/or analyzed during the study are available upon request from the corresponding author.

Funding

All the authors in this study confirm that this work did not receive any specific grant from funding agencies in the public, commercial, or not-for-profit sectors.

Author Contributions

1. Study concept and design or acquisition, analysis, or interpretation of data by Hammad A. Fadlalmola and Eyas Gaffar Abdelraheem Osman. 2. Drafting the article or revising it critically for important intellectual content by Mohammed A. Abdelmalik, Huda K. Masaad, Huda Kh. Masaad, Abdalbasit A. Mariod. 3. Final Approval of the version to be published by Abdalla MA, Osman, Kalthoum I.Yousif. 4. Agreement to be Accountable for Accuracy and Integrity of all aspects of the work by Aisha M. Adam, Sahar A. Ebrahim, and Amal M. Elhusein.

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