



Anxiety, Depression, and Their Contributing Factors among Nurses Infected with COVID-19 in Iran: A Cross-sectional Study

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Abstract

Background: The coronavirus disease 2019 (COVID-19) epidemic is a great challenge among healthcare workers, especially nurses, due to their more frequent and closer contact with patients.

Objectives: This study aimed to evaluate anxiety, depression, and their causes among nurses with COVID-19 infection in different wards of a hospital.

Methods: This cross-sectional study was carried out between February 1st to October 30th, 2020, among all nurses with COVID-19 infection in different wards of Imam Khomeini Hospital (university hospital), Tehran, Iran. The nurses were contacted by phone, and data were collected using a self-administered, valid, structured questionnaire consisting of sociodemographic characteristics and clinical symptoms. Psychological complications, including anxiety and depression levels, were assessed and their association with other sociodemographic variables was also evaluated.

Results: A total of 158 nurses were entered into the study, out of which 112 (70.2%) cases were females. Among all participants, 72.8% and 42.4% of the subjects reported anxiety and depression, respectively. The frequency of moderate to severe anxiety was significantly greater in women than in men ($P < 0.001$). The infected nurses who worked in low-risk departments experienced a greater proportion of moderate to severe depression ($P = 0.004$). In addition, the most prevalent reason for anxiety and depression was found to be the fear of infecting family members.

Conclusion: Nurses bear a significant psychological burden during the COVID-19 pandemic, markedly when they get infected and experience clinical symptoms. Therefore, the government and other staff should provide some facilities and supportive administrative work for reducing anxiety and depression and improving nurses' psychological health.

Keywords: Anxiety, COVID-19, Depression, Nurses

1. Background

Novel coronavirus disease 2019 (COVID-19), a potentially lethal respiratory infection, which was first identified in December 2019 in Wuhan, China, and resulted in a global pandemic, has become a challenge for societies, individuals, and healthcare systems (1, 2). The first official case of COVID-19 in Iran was reported on February 19, 2020, and spread rapidly to all provinces of the country. As of August 19, 2021, the number of confirmed infected cases was 4,556,417 with 99,691 confirmed deaths that had been announced in Iran (3).

Health care workers (HCWs), such as nurses, are always at the frontline and at a higher risk of being infected during epidemics in each country due to the nature of their job and long-term contact with infected patients (4, 5). Close contact with infected and undiagnosed patients has caused the HCWs, especially those involved directly with aerosol-producing procedures in high-risk departments, to contract the disease (6). In addition, other factors, including long excruciating hours of work, a heavy

burden of taking care of COVID-19 patients, and avoidance of using personal protective equipment (PPE), can increase the risk of COVID-19 infection among nurses (7, 8).

More than 152,000 infections have been reported among HCWs, most of whom were nurses and females (7, 9). Common physical symptoms reported for the infected HCWs include fever, cough, weakness, myalgia, anosmia, and gastrointestinal-related symptoms (6, 7).

Nurses represented not only physiological and clinical symptoms of COVID-19 infection but also an unbearable amount of psychological complications, which resulted in high anxiety and depression levels (6, 10-12). One of the most important factors in increasing mental disturbances among nurses is their vulnerability in the face of the possibility of being infected and infecting their families and the people around them while working in demanding conditions under significant psychological stress. The results of previous studies have shown that nurses are more likely to develop psychiatric outcomes following a public health disaster, such as the outbreaks of the

severe acute respiratory syndrome (SARS) and H1N1 (13-15).

2. Objectives

Health care workers, especially nurses as frontline workers, play a key role in fighting against this disease, facing high amounts of workload, and being more susceptible to contracting COVID-19 and psychological disorders. However, there is a lack of evidence on the psychological conditions of the nurses working in different wards and, to the best of our knowledge, no factors have been found to be associated with the psychological well-being of nurses in Iran. For these reasons, it is necessary to pay special attention to nurses' mental health status in order to enable administrators to provide targeted support to their staff and further promote care quality. Therefore, this study aimed to investigate clinical symptoms, psychological status, and the stated reasons for anxiety and depression in nurses with COVID-19 infection and explore their association with background characteristics in one of the referral hospitals for COVID-19 in Tehran, Iran.

3. Methods

3.1. Study design and participants

This cross-sectional study was conducted on nurses working in different wards of Imam Khomeini Hospital (university hospital), Tehran, Iran, from February 1st to October 30th, 2020. This hospital is a major referral center for admitting patients with COVID-19 infection, and nurses in this hospital were at risk of infection due to their direct contact with COVID-19 patients.

Inclusion criteria for participants were (1) being clinical nurse practitioners, (2) aging 18 years and older, (3) lacking a known history of auditory, language, or cognitive problems and being able to interview completely, (4) working full-time, and (5) being clinically diagnosed with COVID-19 or having positive polymerase chain reaction (PCR) test with or without clinical symptoms. On the other hand, the nurses would be excluded if they were (1) retired, (2) participants in other psychological studies simultaneously, and (3) nursing students and visiting scholars. All nurses in the hospital who were infected during the mentioned period and met eligibility criteria were recruited.

3.2. Data collection and procedures

Each participant was explained the aims of the study and informed about the confidentiality of their personal information. The required data were collected using a self-administered, valid, structured questionnaire. The included nurses were interviewed by phone individually by one of the researchers, who confirmed their identity and invited

them to participate in the study. Due to the conditions prevailing in the research environment, COVID-19 pandemic restrictions, and limited attendance at medical centers, the investigation was carried out by phone.

The questionnaire consisted of participants' sociodemographic characteristics, including age, gender, marital status, underlying diseases (e.g., diabetes, cardiovascular diseases, autoimmune diseases, and respiratory diseases), the level of COVID-19 risk in the working department at the time of acquiring infection (emergency, intensive care unit, and infection ward were considered high risk, whereas internal and surgery wards were categorized as low risk), date of confirmation of COVID-19 infection, clinical symptoms of patients, result of PCR and computed tomography (CT) scan test (16), and impact of the disease on their psychological wellbeing (e.g., anxiety and depression). The psychological complication level was determined using the Hospital Anxiety and Depression Scale, which is a 14-item instrument measuring anxiety and depression levels (7 items for each subscale). Each item is rated on a 4-point Likert scale (range 0-3), resulting in 4 anxiety and depression levels of "not at all" (0-7), "mild" (8-10), "moderate" (11-14), and "severe" (15-21) (17).

This study was approved by the Research Ethics Committee of the Faculty of Medicine, Tehran University of Medical Sciences, Tehran, Iran (IR.TUMS.VCR.REC.1399.266). All subjects voluntarily participated and were assured of the confidentiality of all information in this research.

3.3. Data analysis

Results were presented in percentages and numbers and analyzed using the Statistical Package for the Social Sciences (SPSS), version 25 (IBM Corp., Armonk, NY, USA). A Chi-squared test was employed to test associations between categorical variables. A p-value of < 0.05 was considered statistically significant.

4. Results

4.1. Demographic characteristics

Out of 253 nurses with COVID-19 infection, 148 cases participated in this study. The total response rate was obtained at 59.6%. The socio-demographic and questionnaire-related descriptive data of participants are presented in Table 1. The majority of the nurses were females, 112 (70.2%), and married, 95 (64.2%). The mean age of the subjects was estimated at 36.1±0.7 years. It was found that there was no statistically significant difference between gender and demographic characteristics (P>0.05; Table1). Since 7 nurses left the depression subscale empty, the total number for depression analysis decreased to 141. Of the 123 (83.1%) participants

Table 1. Demographic characteristics of participants

Variables	Male (n=36) n (%)	Female (n=112) n (%)	Total n (%)	P-value
Age (years)				
21-30	35 (31.3)	13 (36.1)	48 (32.4)	0.428
31-40	51 (45.5)	11 (30.6)	62 (41.9)	
41-50	18 (16.1)	8 (22.2)	26 (17.6)	
51-60	8 (7.1)	4 (11.1)	12 (8.1)	
Risk level of ward				
Low-risk	17 (47.2)	71 (63.4)	88 (59.5)	0.086
High-risk	19 (52.8)	41 (36.6)	59 (40.5)	
Education degree				
Associate	9 (25.0)	20 (17.9)	29 (19.6)	0.635
Bachelor	25 (69.4)	86 (76.8)	111 (75.0)	
Master or higher	2 (5.6)	6 (5.4)	8 (5.4)	
Marital status				
Single	10 (27.8)	43 (38.4)	53 (35.8)	0.248
Married	26 (72.2)	69 (61.6)	95 (64.2)	
Children				
One or more	14 (38.9)	38 (33.9)	52 (35.1)	0.588
No child	22 (61.1)	74 (66.1)	96 (64.9)	
Underlying Disease				
Yes	6 (16.7)	29 (25.9)	35 (23.6)	0.257
No	30 (83.3)	83 (74.1)	113 (76.4)	
Clinical symptoms				
Overall presence of symptoms	34 (94.4)	109 (97.3)	143 (96.6)	0.595
Malaise and Fatigue	17 (47.2)	65 (58)	82 (55.4)	0.256
Myalgia	24 (66.7)	57 (50.9)	81 (54.7)	0.098
Fever	17 (47.2)	39 (34.8)	56 (37.8)	0.182
Cough	8 (22.2)	40 (35.7)	48 (32.4)	0.132
Dyspnea	8 (22.2)	40 (35.7)	48 (32.4)	0.132
Chills	8 (22.2)	22 (19.6)	30 (20.2)	0.738
Gastroenteritis	9 (25)	21 (18.8)	30 (20.2)	0.417

who took the PCR test, 78.8% were found positive. A total of 30.4% of the nurses had CT scans, among whom 75.5% of the individuals were abnormal according to the radiologic diagnosis of COVID-19 criteria. No significant difference was revealed in the PCR and CT scan results regarding gender ($P=0.85$ and $P=0.241$, respectively). Based on the results of this study, the likelihood of married cases taking the PCR test was lower than that of unmarried cases (77.9% vs. 92.5%, odds ratio [OR]: 0.28, 95% confidence interval [CI]: 0.09-0.88, $P=0.023$). However, among those who developed the infection for the second ($n=35$, 23.6%) and third time ($n=3$, 2%), 86.8% took the PCR test with a positive result in 68.4%.

4.2. Clinical symptoms

The results showed that 6% of the nurses had no symptoms, while 50.1% exhibited more than three symptoms. Moreover, 25.6% of the subjects experienced COVID-19 infection more than once. The most common symptoms were malaise and fatigue (55.4%), myalgia (54.7%), and fever (37.8%) (Table 1). Of 148 nurses with COVID-19 infection, 8 (5.4%) cases were hospitalized, and no significant difference was observed in men and women ($P=1$). There was no statistical association between socio-demographic variables and clinical symptoms in participants.

4.3. Psychological complications

The results of descriptive analysis on nurses

with COVID-19 infection indicated that 72.8% and 42.4% of all participants experienced anxiety and depression, respectively. In terms of anxiety, among 148 nurses, 38 (25.67%), 29 (19.59%), and 41 (27.70%) individuals had mild, moderate, and severe anxiety levels, respectively. Furthermore, out of 141 nurses, these figures for depression were obtained at 14 (9.91%), 32 (22.69%), and 17 (12.06%), respectively. As shown in Table 2, the frequency of moderate to severe anxiety was significantly greater in women than in men (OR: 4.80, 95% CI: 2.27-10.15, $P<0.001$). Though, no such significant difference was found for depression. Additionally, the results of the Chi-square analysis revealed no significant age difference within different levels of anxiety and depression. Comparing the difference between low- and high-risk wards regarding depression levels, the infected nurses who worked in high-risk departments experienced a lesser proportion of moderate to severe depression (OR: 0.26, 95% CI: 0.13-0.55, $P=0.004$). However, anxiety was not significantly different in the two levels of risk in the wards ($P=0.729$). In terms of possible sources of nurses' anxiety and depression (Table 3), the fear of infecting family members was the most common stated cause (80.54%), followed by having a shortage of personal protective equipment (PPE; 30.20%) and being in frontline and observing patients suffering and dying (15.43%).

Table 2. Association of anxiety and depression with sociodemographic variables in nurses with COVID-19 infection

Variable	Anxiety n (%)				Depression n (%)			
	Not at all	Mild	Moderate	Severe	Not at all	Mild	Moderate	Severe
Gender								
Male	18 (50.0)	11 (30.6)	5 (13.9)	2 (5.6)	22 (64.7)	5 (14.7)	6 (17.6)	1 (2.9)
Female	22 (19.6)	27 (24.1)	24 (21.4)	39 (34.8)	56 (52.3)	9 (8.4)	26 (24.3)	16 (15.0)
P-value		<0.001				0.149		
Age (years)								
21-30	13 (27.1)	13 (27.1)	8 (16.7)	14 (29.2)	23 (48.9)	9 (19.1)	7 (14.9)	8 (17.0)
31-40	15 (24.2)	14 (22.6)	15 (24.2)	18 (29.0)	35 (59.3)	3 (5.1)	18 (30.5)	3 (5.1)
41-50	6 (23.1)	8 (30.8)	5 (19.2)	7 (29.6)	13 (56.5)	1 (4.3)	5 (21.7)	4 (17.4)
51-60	6 (50.0)	3 (25.0)	1 (8.3)	2 (16.7)	7 (58.3)	1 (8.3)	2 (16.7)	2 (16.7)
P-value		0.791				0.128		
Risk level of ward								
High-risk	19 (31.7)	15 (25.0)	10 (16.7)	15 (26.7)	43 (72.9)	4 (6.8)	9 (15.3)	3 (5.1)
Low-risk	21 (23.9)	23 (26.1)	19 (21.6)	25 (28.4)	35 (42.7)	10 (12.2)	23 (28.0)	14 (17.1)
P-value		0.729				0.004		
Education								
Associate	9 (31.0)	7 (24.1)	7 (24.1)	6 (20.7)	17 (60.7)	1 (3.6)	6 (21.4)	4 (14.3)
Bachelor	29 (26.1)	30 (27.0)	21 (18.9)	31 (27.9)	59 (55.7)	13 (12.3)	23 (21.7)	11 (10.4)
Master or higher	2 (25.0)	1 (12.5)	1 (12.5)	4 (50.0)	2 (28.6)	0 (0.0)	3 (42.9)	2 (28.6)
P-value		0.763				0.346		
Marital Status								
Single	12 (22.6)	9 (17.0)	13 (24.5)	19 (35.8)	25 (49.0)	4 (7.8)	16 (31.4)	6 (11.8)
Married	28 (29.5)	29 (30.5)	16 (16.8)	22 (23.2)	53 (58.9)	10 (11.1)	16 (17.8)	11 (12.2)
P-value		0.111				0.311		
Children								
No child	26 (27.1)	24 (25.0)	18 (18.8)	28 (29.2)	48 (51.6)	10 (10.8)	23 (24.7)	12 (12.9)
One or more	14 (26.9)	14 (26.9)	11 (21.2)	13 (25.0)	30 (62.5)	4 (8.3)	9 (18.8)	5 (10.4)
P-value		0.948				0.676		
Underlying disease								
No	27 (23.9)	30 (26.5)	25 (22.1)	31 (27.4)	54 (49.5)	13 (11.9)	28 (25.7)	14 (12.8)
Yes	13 (37.1)	8 (22.9)	4 (11.4)	10 (28.6)	24 (75.0)	1 (3.1)	4 (12.5)	3 (9.4)
P-value		0.327				0.073		

Table 3. Frequency and percentage of underlying cause of anxiety and depression stated by participants

Possible Sources of Anxiety and Depression	n (%)
Higher workload and fatigue	19 (12.75)
Isolation, limitations, and quarantine	22 (14.76)
Shortage of personal protective equipment	45 (30.20)
Probability of asymptomatic transmission of the disease to others	9 (6.04)
Death of a friend or family due to COVID-19	17 (11.41)
Unclear employment status	6 (4.03)
Fear of disease complications and death	21 (14.09)
Loneliness during the disease course and lack of somebody to take care	13 (8.72)
Obsession about possible contamination of possessions	10 (6.71)
Being on the frontline and observing suffering patients and mortality	23 (15.43)
Fear of infecting family members	120 (80.54)
Fear of getting the disease for the second time and its effect	16 (10.74)
Fear of ineffectiveness of medications and vaccines	1 (0.67)
Thinking of what will happen if the virus maintains for several years	1 (0.67)

5. Discussion

At this time, the world is confronted with the heavy burden of COVID-19, and HCWs, especially nurses, who are in close contact with the patients, have constantly experienced intensive clinical and psychological disorders, which have led them to a lower quality of life (7, 18, 19). The findings of the present study represented that HCWs, especially nurses, who are in close contact with patients, reported high anxiety and depression levels during the COVID-19 pandemic. Gender and the risk level of the ward were the independent variables related to anxiety and depression, respectively. Additionally,

the main contributors to anxiety were reported to be the fear of infecting family members and a lack of sufficient supply of PPE.

In this single-centered cross-sectional study, only 6.1% of the nurses were asymptomatic and half of them had more than three symptoms. It is comparable with the results of a systematic review and meta-analysis study by Gómez-Ochoa et al. (7) that showed a 40%-pooled prevalence of asymptomatic infection among HCWs even with positive PCR tests. The high proportion of symptomatic HCWs might be due to the fact that only highly clinically suspected staff was tested by COVID-19 diagnostic tests, especially at the beginning of the

pandemic. Moreover, the rate of hospitalization was obtained at 5.4%, which was consistent with that reported in similar studies (7).

The HCWs with COVID-19 represent signs and symptoms comparable to the general population. In our study, malaise, fatigue, and headache were the most frequently reported manifestations among HCWs with COVID-19 that were similar to the results of other previous studies (6, 20-23).

The symptoms and complications of COVID-19 consist of a broad range of manifestations entangling doctors to diagnose the disease at the baseline (19). Hence, the fear and uncertainty of being in a carrier state are invisible sources of mental pressure on frontline nurses and caregivers (24). Evidence suggests a possible adverse impact of clinical symptoms on the psychological status of HCWs, including anxiety, stress, and depression during the pandemic (12). For instance, the findings of a 4-year follow-up of SARS survivors indicated that 40.3% of the cases suffered from chronic fatigue and those with this problem were more likely to have psychiatric comorbidities (25). This fact points to the possible two-way relationship between fatigue and psychiatric problems. Nonetheless, further clarifying studies need to be carried out to distinguish such associations.

The prevalence of anxiety and depression among our population (72.6% and 42.4%, respectively) were close to those reported in similar studies conducted in Iran and other countries. In research by Hassannia et al. (26), the results showed that 65.6% and 42.3% of the participants were considered to have moderate to severe anxiety and depression levels, respectively. In another study in China, the prevalence of anxiety and depression among medical staff was calculated at 45.4% and 57.6%, respectively (27). In addition, in a similar study in Egypt, 42.6% and 59% of the participants were found to suffer from depression and anxiety, respectively (28). The high prevalence of anxiety in our results might stem from this feature of our study population that they were selected from nurses with COVID-19.

Based on the findings of numerous studies, nurses usually experience a higher level of anxiety and stress (26, 29). Furthermore, cultural and conditional differences in various regions should be considered effective factors in the psychological status of nurses infected with COVID-19. Our findings revealed that 27.7% and 12.1% of the nurses had severe anxiety and depression, respectively. This situation affects the staff's performance quality and immunity, and consequently, increases the chance of infection. Therefore, reducing anxiety and depression must be a priority for the authorities of healthcare centers.

In our study, the evaluation of the association between the sociodemographic data and psychological symptoms of participants indicated that female nurses reported more severe anxiety than

their male counterparts, which was consistent with the results of other studies (29, 30). This finding might be related to the difference in gender characteristics and could be attributed to the fact that women were more concerned about inner experiences and self-perceptions, which made them more fragile and sensitive and more vulnerable to anxiety (31, 32).

No significant relationship was observed in the current research between age and level of anxiety and depression. Unlikely, the results of a similar study conducted in China indicated that the age of medical staff was negatively correlated with depression and anxiety (27). This discrepancy might be due to the cultural differences between Iran and China. In the present study, it was observed that the working department and psychological status were significantly related. Nurses working in high-risk departments were less likely to experience depression than those working in low-risk departments, potentially because of their prior preparedness for their carrier. Another study among pediatric nurses argued that nurses working in isolation wards or fever clinics had lower depression, anxiety, and stress levels (33).

Considering the underlying reason for anxiety and depression, similar to our study, the findings of a study by Siddiqui et al. in the UK showed that the most common reasons for anxiety among healthcare professionals were the risk of exposure to COVID-19 for themselves, family, and patients and the lack of PPEs (34). This highlights the need for protecting HCWs properly in order to reduce their fear of disease transmission to others and lack of sufficient PPE. However, due to mass vaccination and immunization against COVID-19 in recent months, the fear of disease and infection development in family members has decreased (35).

The main strength of our study was finding the association of sociodemographic characteristics of nurses with depression and anxiety during the COVID-19 pandemic, in addition to the main causes of them, which can help policymakers design better and more efficient programs in order to have better care for all patients provided by nurses. Several limitations were encountered in our study. Firstly, all the participants were from one center, which limited the generalization of our findings to other healthcare institutions in Iran. Secondly, psychological outcomes among nurses could certainly have been more pronounced if the study had been conducted in a larger population for a longer duration. Thirdly, the interviews were conducted over the phone due to social distancing cautions, and some nurses refused to answer, mainly because they were unfamiliar with the interviewers and unwilling to respond comprehensively. Perhaps, if the interviews were conducted in person with the possibility of gaining nurses' trust, better results would have been

achieved. Finally, response bias might still exist, especially if the nurses who did not respond were either too stressed to respond or not stressed at all to answer the questions. Therefore, it may be needed to conduct further multicenter studies with a face-to-face interview frame for an extended longitudinal study.

6. Conclusion

Healthcare workers, especially nurses with COVID-19 infection, experienced clinical and psychological complications, such as anxiety and depression, during the current pandemic. Gender was associated with anxiety and working in high-risk wards for COVID-19 was related to depression in HCWs. In this regard, the government and other staff should provide some facilities and supportive administrative work for reducing anxiety and depression and improving the nurses' psychological health even in low-risk wards. The rearrangement of working hours and the creation of working and resting conditions can affect not only the risk of infection but also the possibility of psychological disturbances.

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