

Research Paper

Predicting the Risk of COVID-19 Among Healthcare Staff Based on the Components of Depression and Death Anxiety

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**ABSTRACT**

Background: Physicians' and nurses' experience of the COVID-19 pandemic and its physical and psychological consequences can be associated with changes in biological and hormonal levels experienced as fatigue, restlessness, disruptions in one's mood, and sleep quality. This study examined the role of depression and death anxiety in contracting COVID-19 among healthcare staff.

Methods: The statistical population of this descriptive correlational research comprised nurses and nurse assistants working in Tehran (Iran) hospitals from the summer to winter of 2021. A sample of 156 was selected to fill out a demographic information form, Templer's death anxiety scale, and Beck's depression inventory. The data were analyzed in SPSS software, version 25.0 using logistic regression analysis.

Results: The model based on three predictors of depression (cognitive, affective, and physical components) led to a significantly better prediction compared to the fixed-effects model ($P < 0.001$). The affective component of depression was a more powerful predictor of the risk of COVID-19 than the other two components. The model based on three predictors of death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor) also led to a significantly better prediction compared to the fixed-effects model ($P < 0.001$). All three components of death anxiety were statistically significant predictors of COVID-19 risk.

Conclusion: Consequently, depression and death anxiety seem to predict and explain the risk of COVID-19 in healthcare staff by altering cognitive, affective, and physical conditions.

Keywords: Anxiety, Depression, COVID-19, Fear, Nurses

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1. Introduction

In December 2019, the rapid outbreak of a viral disease called COVID-19 posed a new challenge to the world [1]. Healthcare staff was among the groups to be involved in and at risk of COVID-19. The rapid outbreak of the disease, insufficient information about the functioning of the virus and treatment methods, shortage of facilities and equipment, and the absence/shortage of medication threatened the physical and mental health of healthcare staff like billions of other people [2]. The increased stress due to exposure to COVID-19, caring for COVID-19 patients, and witnessing their death further increased the risk of psychological disorders such as depression, death anxiety, and stress among healthcare staff [3, 4].

The widespread, diverse, and negative psychological effects of the pandemic such as anger, distress, depression, and anxiety are associated with long-term quarantine, fear of COVID-19, hopelessness, anticipated shortage of necessities, insufficient information, economic problems, and stigma [5]. Studies have confirmed the existence of depression, stress, anxiety, and psychological impacts of COVID-19. Depression, anxiety, and poor sleep quality have also been reported among physicians and medical staff. With the onset of the pandemic, the level of anxiety and depression increased and sleep quality declined among physicians and medical staff [6]. Nadeem et al. [7] confirmed the existence of depression, stress, and anxiety among nurses working in COVID-19 wards. Results reported by Ariapooran and Amirimanesh [8] also supported the high prevalence of depression, anxiety, and suicidal ideation among nurses during the pandemic. A high level of anxiety among female nurses, a high rate of suicidal ideation and anxiety in single nurses, and severe anxiety among the emergency department, CCU, and ICU nurses were also highlighted.

It has been shown that the exacerbation of depression is a major psychological consequence of the current situation that can lead to chronic symptoms such as intrusive memories, avoidant behaviors, irritability, and emotional numbness [9]. Physicians' and nurses' experience of the pandemic and its physical and psychological consequences can be associated with changes in biological and hormonal levels experienced as fatigue, restlessness, disruptions in one's mood, appetite, sleep, energy level, etc. [10]. Stress and depression negatively impact the immune system, and a weaker immune system exposes the person to a variety of diseases and prolongs the recovery period [11, 12]. Anxiety is another common

problem experienced by most people, including healthcare staff. Fear and anxiety about the possible contraction of the disease and experiencing its consequences impose a heavy and destructive psychological burden that can lead to mental disorders, weaken the immune system, and reduce the body's ability to fight diseases in different groups, including healthcare staff (nurses, physicians, etc.) [13, 14].

It is not unexpected for those who deal with humans to experience more death anxiety because of the nature of their profession. Healthcare staff, especially those who work in the ICU and deal with critically ill patients, may experience a higher level of death anxiety. Death anxiety is defined as an unusual fear of one's or someone else's death [15]. Salmanian and Marashian [16] confirmed the existence of a high level of death anxiety in patients with cancer. Those with death anxiety are more likely to struggle with depression, generalized anxiety disorder, severe mental illness, and a feeling of worthlessness [17]. In the long run, death anxiety is associated with depression, substance abuse, and reduced efficiency among nurses [18]. In a cross-sectional study, Ustukus and Eskimez [19] investigated the effect of death anxiety in nurses on their approach to dying patients and reported that nurses experienced mild death anxiety and exhibited a moderate attitude of avoidance toward death and dying patients. Tamrakar et al. [20] reported that anxiety and depression are significantly higher in COVID ICU nurses. Based on the results of Karabag Aydın and Fidan [21], nurses of COVID-19 patients experienced death anxiety with an adverse effect on their life satisfaction.

The emergence of an unknown and mysterious disease such as COVID-19 can doubtlessly increase and intensify the experience of psychological problems such as anxiety and death anxiety, which is a type of anxiety. Death anxiety has intensified during the pandemic, and healthcare staff runs a higher risk of experiencing various psychological disorders, including mood disorders and anxiety, due to more direct exposure to COVID-19 and its consequences. It is essential for managers of the health system, especially hospitals, to be aware of the level of stress, anxiety, and depression of healthcare staff. In addition, it is very important and significant to provide psychological support programs to improve the mental health of nurses and healthcare staff during the COVID-19 pandemic. Hospitals in Tehran were among the first and main COVID-19 treatment centers in Iran, and their hospital staff inevitably faced a sharp increase in working hours and their responsibilities due to the sudden exposure to a very large number of critically ill patients with COVID-19. Many of them contracted the

disease, and many witnessed the disease and death of their family, friends, colleagues, or others, and thus experienced severe stress (especially in the early months). These undesirable conditions could have had a serious impact on their physical and mental health, further exposing them to a variety of psychological problems and disorders such as depression, anxiety, fear of death, sleep disorders, and dysfunctions. One of the most important innovations of the present study, which has not been addressed in previous research, is the examination of the relationship between the risk of contracting COVID-19 and anxiety and depression in healthcare staff. Accordingly, this study aimed to determine the role of depression and death anxiety in contracting COVID-19 among healthcare staff.

2. Methods

The study used a descriptive correlational research design. The statistical population comprised 1020 nurses and nurse assistants working in Tehran hospitals in the summer and winter of 2021. A sample of 156 was conveniently selected, provided informed consent for participation, and filled out the questionnaires. Three hospitals of Nikan Gharb, Nikan Aghdasiyeh, and Iran Mehr were selected from private hospitals in Tehran by stratified random sampling. The sample size was determined using Morgan's sample size table ($n=155$ if $N>270$). The inclusion criteria were being a healthcare staff in Tehran private hospitals, willingness to participate in the study, and not having other limiting diseases (based on self-declaration). The exclusion criteria were handing out incomplete questionnaires (failing to respond to 10% of the questions) and contracting a disease. The hypotheses were tested using logistic regression analysis.

Instruments

Death Anxiety Scale (DAS): The 15-item DAS was developed by Templer in 1970 to measure death anxiety. The respondents answer each question with yes (death anxiety) or no (no death anxiety). The scores range from 0 to 15, and scores >8 indicate a high level of death anxiety. In the present work, Cronbach's alpha coefficient was 0.87 for the scale. Kianpour Barjoe et al. [22] reported the reliability of this scale equal to 0.86 based on the Cronbach alpha coefficient. Sharif Nia et al. [23] confirmed the construct validity of the Persian version of DAS using exploratory factor analysis. The test-retest reliability of the Persian version of DAS was reported 0.91 [23].

Beck's depression inventory (BDI-II): The BDI-II is a 21-item self-assessment instrument developed by Beck in 1961 to assess the severity of depression. Although its content taps into the comprehensive symptomology of depression, it mostly emphasizes cognitive content. Respondents answer the questions on a four-point scale from 0 to 3. Two items evaluate affect, 11 items cognition, 2 items overt behaviors, 5 items somatic symptoms, and one item evaluates interpersonal symptomology. The total score ranges from 0 to 63. By summing the scores of each item, the total score is obtained directly and represents different degrees of depression: 0-13: minor depression, 14-19: mild depression, 20-28: moderate depression, and 29-63: severe depression. Jafari et al. [24] reported a Cronbach alpha of 0.85 for BDI-II. In the present study, the Cronbach alpha coefficient was 0.89 for the questionnaire. The content validity, concurrent validity, and factor validity of the Persian version of BDI-II were confirmed [25]. The test-retest reliability of the Persian version of BDI-II was reported 0.74 [26].

3. Results

There were 156 participants in this study, of whom 114 (73.1%) were women and 42 (26.9%) were men. Forty-seven participants (30.1%) had no history of COVID-19, while 109 (69.9%) had a history of COVID-19. Moreover, 32 (20.5%) aged less than 30 years, 36 (23.1%) 31-35 years, 47 (30.1%) 36-40 years, 21 (13.5%) 41-45 years, and 20 (12.8%) >45 years. Eighty-six participants (55.1%) had an undergraduate education, 49 (31.4%) had a master's degree, and 21 (13.5%) had a PhD. Finally, 52 (33.3%) were single, while 104 (66.7%) were married. Table 1 shows the Mean \pm SD and correlation coefficients between the components of depression (cognitive, affective, and physical) and death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor).

The Pearson correlation coefficients between the components of depression and anxiety in healthcare staff are presented in Table 1. According to the results, all three components of depression (cognitive, affective, and physical) significantly and positively correlated with the components of death anxiety ($P<0.01$) (Table 1).

The data were first checked for normal distribution, collinearity, and the variance inflation factor. Based on the results, the presuppositions of data analysis were provided. Logistic regression analysis was performed to analyze the data. To predict the risk of contracting COVID-19, the components of depression (cognitive, affective, and physical) and death anxiety (absolute anxiety of death, fear of pain and surgery, and the general fac-

Table 1. Mean±SD and correlation coefficients between the variables

Variables	Mean±SD	1	2	3	4	5	6
Depression-Cognitive	8.53±4.32	1					
Depression-Affective	6.12±2.92	0.63**	1				
Depression-Physical	8.74±4.94	0.59**	0.50**	1			
Death anxiety-Absolute death anxiety	2.02±1.42	0.29**	0.30**	0.22**	1		
Death anxiety-Fear of pain and surgery	2.41±1.53	0.27**	0.24**	0.21**	0.38**	1	
Death anxiety-General factor	1.45±1.27	0.25**	0.33**	0.23**	0.49**	0.55**	1

**P<0.01



tor) were included in the prediction equation. The results of logistic regression analysis revealed that the model based on three predictors of depression (cognitive, affective, and physical components) led to a significantly better prediction compared to the fixed-effects model (R2=0.721; P<0.001). The components of depression explained 72.1% of the variance of contracting COVID-19. In other words, the components of depression could well distinguish those with and without COVID-19. The group membership prediction success was high (87.2% for the overall success rate, 89% for predicting membership in the patient group, and 83% for predicting mem-

bership in the non-patient group). Table 2 presents the regression coefficients (B), Wald statistics, the significance level, odds ratio [Exp (B)], and 95% confidence intervals for odds ratios for each predictor.

Based on Table 2 and according to the Wald test, all three components of depression were statistically significant predictors of the risk of COVID-19. The affective component of depression was a more powerful predictor of the risk of COVID-19 than the other two components. By controlling the other components of depression, a unit increase in the score of the affective component

Table 2. Logistic regression results to predict the risk of contracting COVID-19 using components of depression

Variables	B	SE	Odds Ratio	P	Exp (B)	95% Confidence Interval (CI)		
						Lower limit	Upper limit	
Cognitive	0.56	0.15	11.93	0.001	1.69	1.26	2.28	
Depression	Affective	0.75	0.18	18.16	0.001	2.12	1.50	3.00
	Physical	0.34	0.12	8.00	0.005	1.40	1.11	1.77
Fixed-effects model	-8.35	1.70	23.99	0.001	-	-	-	



Table 3. Logistic regression results to predict the risk of contracting COVID-19 using components of death anxiety

Variables	B	SE	Odds Ratio	P	Exp (B)	95% Confidence Interval (CI)		
						Lower limit	Upper limit	
Absolute death anxiety	0.84	0.21	16.22	0.001	0.43	0.29	0.65	
Death anxiety	Fear of pain and surgery	0.61	0.19	10.35	0.001	0.54	0.38	0.79
	General factor	0.60	0.24	6.12	0.013	0.55	0.34	0.88
Fixed-effects model	-5.51	0.87	39.77	0.001	-	-	-	



increased the risk of COVID-19 by 2.12 times. Consequently, all three components of depression (cognitive, affective, and physical) positively and significantly predicted the risk of COVID-19 in the healthcare staff.

Moreover, the model based on three predictors of death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor) led to a significantly better prediction compared to the fixed-effects model ($R^2= 0.565$; $P<0.001$) (Table 3). The components of death anxiety explained 56.5% of the variance of contracting COVID-19. In other words, the components of death anxiety could well distinguish those with and without COVID-19. The group membership prediction success was high (85.9% for the overall success rate, 90.8% for predicting membership in the patient group, and 74.5% for predicting membership in the non-patient group). Table 3 lists the regression coefficients (B), Wald statistics, the significance level, odds ratio [Exp (B)], and 95% confidence intervals for odds ratios for each predictor.

Based on the Wald test, all three components of death anxiety were statistically significant predictors of COVID-19 risk. The general factor of death anxiety was a more powerful predictor of the risk of COVID-19 than the other two components. Overall, the results of logistic regression analysis indicated that all three components of death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor) positively and significantly predicted the risk of COVID-19 (Table 3).

4. Discussion

The present study aimed to determine the role of depression and death anxiety in contracting COVID-19 among nurses and nurse assistants working in Tehran hospitals. The findings revealed that the components of depression (cognitive, affective, and physical) and death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor) positively and significantly predicted the risk of COVID-19 in the healthcare staff based on the regression analysis, and the components of depression (cognitive, affective and physical) positively and significantly predicted the risk of COVID-19 in the target group. The present study, in line with many previous studies, confirmed the increase in and prevalence of depression and anxiety, especially death anxiety [15, 18]. These findings are consistent with the results of studies confirming the relationship between depression and the risk of COVID-19 [8, 9]. Research has supported the presence of depression, stress, anxiety, and the psychological impacts of COVID-19 among medical staff [7]. The continuous experience of stress caused by COVID-19 and its consequences can impact mood, appe-

tite, and sleep by reducing serotonin levels, leading to the experience of depression [27]. Depression is associated with increased activity in the hypothalamic–pituitary–adrenal axis and, thus, symptoms such as fatigue, restlessness, impatience, inability to feel pleasure, and decreased energy. Physical problems caused by depression can predict the rate of COVID-19 by affecting the immune system [28]. Stress and depression can trigger an inflammatory response and thus increase the risk of contraction and exacerbation [29]. Depression and anxiety are also associated with other problems, such as poor sleep quality and the possibility of suicidal ideation [8].

Based on the findings, the affective component of depression positively and significantly predicted the risk of COVID-19 in the target group. Biological dysfunctions can affect one's emotions. Feelings of sadness, demotivation, and disinterest can make it difficult to perform and pursue things that used to be less difficult [30]. According to a study, hospital staff in quarantine show signs of fatigue, isolation, seclusion, irritability, reduced decision-making ability, and poor concentration [31]. Demotivation and disinterest in activities can reduce COVID-19 preventive behaviors in and out of the hospital setting, thereby affecting the rate of COVID-19.

As for the role of the cognitive components of depression in predicting the risk of COVID-19 among the healthcare staff, it should be noted that demotivation, disinterest, and negative emotions can lead to poor concentration, memory impairment, impaired planning, and decision-making, poor problem-solving ability, and decreased cognitive flexibility. Poor concentration and impaired memory can interfere with decision-making to perform effective health and preventative behaviors, which can increase the risk of contraction. In such situations, people have difficulty adapting to the environment, and the risk of maladaptive coping strategies such as overeating, smoking, alcohol, and drug consumption increases, thereby doubling their vulnerability to COVID-19. When the ability to refrain from a dysfunctional response is reduced and having more adaptive and healthy responses becomes difficult, it becomes more challenging to follow the guidelines on health and prevention for people who are more exposed to various diseases due to their profession, and all this puts them at a higher risk of infectious diseases, including COVID-19 [31]. In brief, the components of depression, including the physical (e.g., fatigue, lack of energy), cognitive (poor concentration, difficulty in decision-making), and affective (sadness, hopelessness) components seem to interact to predict the risk of COVID-19 in the target group.

The results of regression analysis showed that the components of death anxiety, including absolute death anxiety, fear of pain and surgery, and the general factor positively and significantly predicted the risk of COVID-19 in the healthcare staff. These findings are consistent with the results of studies confirming the association between depression and COVID-19 risk [32].

Research supports the relationship between death anxiety and depression, generalized anxiety disorder, feelings of worthlessness, substance abuse, reduced efficiency in nurses, and psychological distress [17, 32]. Results on the prevalence of COVID-19 have indicated that stressful conditions caused by this disease are significantly related to common mental disorders, especially death anxiety [33]. Fear of COVID-19 explains the heightened levels of depression, general anxiety, and death anxiety. This level of stress associated with the pandemic is significantly associated with psychological distress and its devastating consequences for the individual and society [32]. Karabag Aydın and Fidan [21] examined death anxiety and its role in the physical and psychological dimensions of nurses working in COVID-19 wards. They emphasized the importance of providing support systems in hospitals to promote nurses' performance.

COVID-19 anxiety and fear of death in the short term seem to help people cope with the pandemic crisis and prevent the spread of the virus by observing social distancing, following quarantine rules, observing health and self-care protocols, etc. Death anxiety thus seems to be negatively correlated with COVID-19 in the short term. Nevertheless, the continuation of the crisis, quarantine, and emergency and critical conditions, especially for doctors, nurses, paramedics, and other healthcare staff may lead to chronic anxiety, especially death anxiety, as one of its most common types.

The fear of contracting COVID-19 and death has caused a wave of panic in societies. Everyone harbors a fear of death, but the anxiety of loss becomes more pronounced in critical situations. In such situations, caregivers (including healthcare staff) and patients with COVID-19 deal with an extremely high level of the stress hormone, cortisol, which can be regarded as an indicator of the severity of the disease. The continuous and excessive secretion of cortisol leads to symptoms such as immune system suppression increasing the risk of various physical and psychological diseases. This group of people also suffers from other symptoms such as insomnia, being startled, and excessive arousal and alertness due to the dysregulation of the noradrenergic system. Increased serotonin levels have also been observed in people with

anxiety disorders (and death anxiety) [34]. Exposure to the news of the morbidity and mortality of thousands of people due to this disease and the inevitable confrontation with it (especially among healthcare staff) has several health impacts. Constant exposure to critically ill COVID-19 patients, the serious responsibility of maintaining human health, repeated exposure to emergencies, and observing high mortality during the pandemic can increase nurses' experience of stress and anxiety [35].

Numerous factors, including death anxiety and cognitive emotion regulation strategies, are associated with anxiety and might be related to COVID-19 anxiety as well. Blaming oneself and others, rumination, and catastrophizing are among maladaptive emotion regulation strategies in stressful events that can increase the risk of COVID-19 due to exacerbated stress, depression, fear, and anxiety, (including fear and anxiety of death) in those who are in contact with COVID-19 patients [36]. Inadequate scientific information, the emergence of new clinical symptoms, the fear of being infected by or infecting others, insufficient support, lack of access to adequate medical and pharmaceutical facilities, fatigue and impatience due to prolonged quarantine, and recurrent peaks of the pandemic, along with unpleasant thoughts such as hopelessness and loneliness are associated with decreased control and increased confusion in people with high death anxiety. All this may lead to reduced compliance with preventive measures and thus increase the risk of COVID-19. In such situations, people are more at risk of experiencing anxiety, including death anxiety, by feeling out of control. Death is a biological fact no one is immune to, which stresses human vulnerability despite technological and medical advances [37].

The results of the current study should be interpreted while keeping certain limitations in mind. These results represent a sample of healthcare staff in Tehran hospitals. As such, caution should be exercised when generalizing the results to other groups and populations having different human resources and facilities. As convenience sampling was performed herein, the results should be generalized with caution. Since the present study was conducted in Tehran hospitals, to make the results more generalizable, it can be replicated in other cities and among other sociocultural groups given that other hospitals have different medical facilities. Other influential variables that may play a role in the relationship between COVID-19, depression, and death anxiety (fear of death) have not been studied. It is therefore essential to study the direct and indirect role of variables such as social support and locus of control in future studies. The moderating role of sex, place of service in the hospital, and

the type of responsibility of the healthcare staff can also be included in future models.

5. Conclusion

The current study offered insights into the relationship between COVID-19, depression, and death anxiety (fear of death) among healthcare staff. The components of depression (cognitive, affective, and physical) and death anxiety (absolute death anxiety, fear of pain and surgery, and the general factor) positively and significantly predict the risk of COVID-19 in the target group. Therefore, depression and death anxiety seem to predict and explain the risk of COVID-19 in healthcare staff by altering cognitive, affective, and physical conditions. To adopt appropriate measures, psychological evaluation of healthcare staff as the first line of treatment seems necessary. Treatment and educational protocols such as stress and anxiety management training should also be developed to control and manage depression and death anxiety.

Ethical Considerations

Compliance with ethical guidelines

The study was approved by the Ethical Committee of Islamic Azad University, Roudehen Branch (Code: IR.IAU.R.REC.1400.021).

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Authors' contributions

Both authors equally contributed to preparing this article.

Conflict of interest

The authors declare no conflict of interest.

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