

Association of Emotional Response Indicators with the Risk of Recurrence and Hospitalization in Coronavirus Patients

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Abstract

Anxiety, stress, and fear can adversely affect the mental and physical health of people. The present study aimed to examine the association of these emotional response indicators with outcomes (recurrence, hospitalization, and mortality) in coronavirus 2019 (COVID-19) patients. A prospective cohort study was conducted between February 2020 and July 2021 in three hospitals in Tehran, Iran. The included patients (n=350) completed three questionnaires on COVID-19-related anxiety, stress, and fear. Patients with at least one emotional response indicator were assigned to the exposed group (n=157) and those without to the unexposed group (n=193). After one month of follow-up, the medical condition of all participants was determined through phone calls. Data were analyzed with logistic and multivariate regression models using STATA 9 software. The number of patients with COVID-19 recurrence in the exposed and unexposed groups was 71 (45%) and 16 (8%), respectively, and for hospitalization 79 (50%) and 16 (8%), respectively. The relative risk of recurrence and hospitalization due to COVID-19 in the exposed group was 5.62 and 6.25 higher than in the unexposed group, respectively (P<0.001 for both). The results of regression analysis showed that underlying diseases were not significantly associated with recurrence and hospitalization. The total number of deaths was six, all of which were in the exposed group. Given the greater risk of recurrence and hospitalization in COVID-19 patients with anxiety, stress, or fear, there is a need to devise and implement appropriate strategies to prevent and manage mental disorders.

What's Known

The behavioral response of many people to a pandemic is fear and anxiety. Psychological disorders can adversely affect the mental and physical health of people.

What's New

The mortality rate in patients with anxiety, stress, or fear is higher than in other individuals. The risk of recurrence of COVID-19 and hospitalization in people suffering from anxiety, stress, or fear related to the disease is six times higher than in other people.

Kew Words: anxiety stress fear; Covid-19; hospitalization recurrence;

Introduction

In late 2019, coronavirus disease 2019 (COVID-19) first emerged in a seafood market in Wuhan, China. It spread rapidly to other countries and

became a global pandemic. 1 Clinical observation showed that fear and anxiety were prominent behavioral responses of many people to the disease

during the pandemic. For instance, fear of becoming infected, fear of touching surfaces or objects that could be contaminated, fear of other people who could be a carrier, and fear of social and economic consequences. 2 Fear, anxiety, and stress are natural reactions to adverse events and affect various aspects of life. 3 These can affect mental and physical health and play a role in our behavioral response to viral diseases, which in turn determine the spread or containment of infectious diseases. Given the above, the present study aimed to examine a possible association of emotional response indicators (anxiety, stress, and fear) with outcomes (recurrence, hospitalization, and death) in COVID-19 patients.

Patients and Methods

A prospective cohort study was conducted between February 2020 and July 2021 at Rajaie Cardiovascular, Medical and Research Center in Tehran, Iran. Using the census method, 350 outpatients referred to the emergency department of three hospitals in Tehran (Iran) were included in the study. The inclusion criteria were age ≥ 18 years and a first-time visitor to the outpatient clinic with a diagnosis of COVID-19 by a physician. To ensure homogeneity between patients in terms of disease severity, hospitalized patients were excluded from the study. In addition to a demographic survey form, the participants completed three self-report questionnaires, namely the Corona Disease Anxiety Scale (CDAS), Corona Stress Scale (CSS), and Fear of COVID-19 (FCV) scale. The total scores obtained from these questionnaires were used to assign the participants to the exposed and unexposed groups. The scores of 9 for fear, 18 for anxiety, and 33 for stress were used as the cut-off points. Patients with at least one of these emotional response indicators (score \geq cut-off point) were allocated to the exposed group (n=157) and those without, to the unexposed group (n=193). In line with the inclusion criteria, none of the participants had a previous COVID-19 infection, nor were previously hospitalized due to the disease. In the case of the subsequent death of a patient already included in the study, the information was obtained from the family members. Considering the disease incubation period and the maximum time interval between infection and hospitalization, the patients were followed up for one month. Then, the association of the scores of emotional response indicators with patient outcomes was determined for each group and compared. The study was approved by the Ethics Committee of Iran University of Medical Sciences, Tehran, Iran (code: IR.RHC.REC.1399.136). Written informed consent was obtained from the patients for the publication of the study.

Self-report Instruments

A demographic survey form was used to obtain information such as age, sex, education level, marital status, number of family members, number of children, place of residence, ethnicity, employment status, monthly income level, history of other diseases, and illness duration. The 18-item CDAS self-report questionnaire was used to measure the level of anxiety. The final

version of this instrument included 18 items and two factors. Items 1-9 measured the psychological symptoms, and items 10-18 measured the physical symptoms. These items were scored on a four-point Likert scale (never=zero, sometimes=1, most of the time=2, always=3) with a total score ranging from 0 to 54 points.

A higher total score indicates a higher level of anxiety due to COVID-19. The validity and reliability of CDAS were confirmed in a previous study. 4 The reliability of CDAS was reported with a Cronbach's alpha coefficient of 0.879 for psychological symptoms and 0.919 for physical symptoms. Based on the opinion of 10 experts, the reported content validity ratio and index were 0.65 and 0.85, respectively. The 36-item CSS self-report questionnaire was used to measure stress due to COVID-19. It consisted of five sections, namely danger and contamination fears, fears of socio-economic consequences, xenophobia, compulsive checking and reassurance-seeking, and traumatic stress symptoms. Each section included six items and was scored on a five-point Likert scale (never=zero, rarely=1, sometimes=2, most of the time=3, almost always=4). The total score ranged from 0 to 144 points, where a higher total score indicates a higher level of stress. Based on the opinion of 10 experts, the reported content validity ratio and index were 0.77 and 0.83, respectively. 5 The five-item FCV self-report scale assessed the fear of COVID-19. FCV items were scored on a five-point Likert scale (very low=1, low=2, average=3, high=4, very high=5), ranging from 5 to 25. A higher total score indicates a greater fear of coronavirus. A previous study confirmed the validity and reliability of FCV. 6 The reliability of FCV was reported with a Cronbach's alpha coefficient of 0.81. The reported content validity ratio and index were 0.72 and 0.80, respectively.

Statistical Analysis

Data were analyzed with logistic and multivariate regression models using STATA software, version 9 (StataCorp, College Station, TX). Shapiro-Wilk and information matrix tests were used to determine the normal distribution of the fear, anxiety, and stress data. Since the data were not normally distributed, the median scores of fear, anxiety and stress data were used to determine a cut-off point, based on which the participants were assigned to the exposed or unexposed groups. The variance inflation factor (VIF) test was used to examine the accuracy of multivariate regression results in terms of the effect of confounding variables on the outcomes, and to examine linearity between independent variables. In line with previous studies, all risk factors associated with COVID-19 (history of hypertension, diabetes mellitus, heart valve disease, heart failure, cardiovascular diseases) were included in the model. $P < 0.05$ was considered statistically significant.

Results

Demographic characteristics of the participants in both exposed (n=157) and unexposed (n=193) groups are presented in [table 1](#).

Variable	Category	Groups (n, %)		P value*
		Exposed (n=157)	Unexposed (n=193)	
Age (year)	18-40	43 (27.38)	60 (31.08)	0.625
	40-60	57 (36.30)	73 (37.82)	
	>60	57 (36.30)	60 (31.08)	
Sex	Male	67 (42.68)	95 (49.22)	0.726
	Female	90 (42.68)	98 (50.78)	
Marital status	Single	12 (42.68)	34 (17.62)	0.511
	Married	124 (42.68)	139 (72.02)	
	Divorced	6 (42.68)	9 (4.66)	
	Widowed	15 (42.68)	11 (5.70)	
Education	Illiterate	37 (42.68)	30 (15.54)	0.695
	Under diploma	46 (42.68)	42 (21.76)	
	Diploma	31 (42.68)	64 (33.16)	
	Academic degree	43 (42.68)	57 (29.53)	
Place of residence	Capital	89 (42.68)	126 (65.28)	0.452
	Small cities	68 (42.68)	67 (34.72)	
Employment status	Unemployed	9 (42.68)	14 (7.25)	0.856
	Student	1 (42.68)	4 (2.07)	
	Employee	29 (42.68)	41 (21.24)	
	Housewife	58 (42.68)	58 (30.05)	
	Retired	31 (42.68)	32 (16.58)	
	Employed	13 (42.68)	20 (10.36)	
	Other	16 (10.19)	24 (12.44)	
History of underlying diseases		129 (82.16)	155 (80.31)	0.725

Table 1

The relative risk of recurrence and hospitalization due to COVID-19 were 5.62 ($P=0.042$) and 6.25 ($P=0.039$), respectively (table 2). The total number of deaths was six, and the proportion of mortality in the exposed and unexposed groups was 4% and zero, respectively. The logistic model was used to compare the groups in terms of recurrence and hospitalization. Given that the number of deaths in the exposed group was six, no statistical analysis

was performed. The relative risk of COVID-19 recurrence in the exposed group was 6.25 (95% CI: 5.0-16.64) times higher than the unexposed group ($P<0.001$). Moreover, the risk of hospitalization in the exposed group was 5.62 (95% CI: 6.15-20.41) times higher than the unexposed group ($P<0.001$). The results of regression analysis showed that the underlying diseases were not significantly associated with recurrence and hospitalization.

Index	Group	Proportion	P value*	95 %confidence interval
Recurrence	Exposed (n=71)	45%	0.042	0.37-0.53
	Unexposed (n=16)	8%		0.04-0.12
Hospitalization	Exposed (n=79)	50%	0.039	0.42-0.58
	Unexposed (n=16)	8%		0.04-0.12
Mortality	Exposed (n=6)	4%	0.092	0.01-0.06
	Unexposed (n=0)	0		0.00

*Mann-Whitney test (P<0.05 is statistically significant)

Table 2: Descriptive statistics for outcome variables in both the exposed and unexposed groups

We also examined the effect of confounding variables such as a history of hypertension, diabetes mellitus, heart valve disease, heart failure, and cardiovascular diseases (tables A, B, and C in appendix 1). A linear regression model was used to examine the effect of these confounding variables on recurrence, hospitalization, and mortality in COVID-19 patients. In terms of mortality, considering the six deaths in the exposed group, the results showed that a history of hypertension was the only variable that contributed to the increased mortality. However, in terms of recurrence and hospitalization, none of the confounding variables had a significant effect. Therefore, the observed increase in these outcomes was primarily due to anxiety, stress, or fear. The effect of confounding variables on the outcomes was also examined using the VIF test. In regression analysis, the term collinearity is used when there is a complete or exact linear relationship between all or some of the explanatory variables. In general, collinearity could be complete or incomplete. The conditions indicating severe or complete collinearity between variables are that at least one VIF is greater than 10, and the average of VIFs is greater than one. [7] The results of the linearity test showed no complete or exact collinearity between explanatory variables in the regression model; again, confirming that the above-mentioned confounding variables did not have any effect on the outcomes.

Discussion

The findings of this study showed that the incidence of COVID-19 recurrence and subsequent hospitalization is higher in people with anxiety, stress, or fear of COVID-19 than other people. In a cohort study in New Zealand, poor mental health was associated with worry and an increased risk of COVID-19 infection, such that worrying about contracting COVID-19 caused anxiety and stress. [8] Another study reported that all their COVID-19 patients experienced severe or very severe anxiety, and more than one-third of the patients had a history of psychiatric disorders. [9] Similarly, we found that all our patients who were hospitalized or isolated due to COVID-19 experienced some degree of anxiety, stress, and fear. The reported anxiety in our study is consistent with the results of a previous study stating mild depression and anxiety among 70 COVID-19 survivors. [10] The main strength of the present study lies in its prospective cohort design, whereas the majority of previous studies were descriptive. In addition, to our knowledge, no previous studies in COVID-19 patients examined the association between recurrence and hospitalization on the one hand, and fear, anxiety, and stress on the other hand. One of the limitations of our study was the absence of psychiatric interventions. Another limitation was the high number of COVID-19 patients with underlying diseases. Although we found no significant association between underlying diseases and emotional indicators, it is recommended to conduct further studies in COVID-19 patients without any underlying diseases and with a larger sample size.

Further prospective studies are recommended to investigate the association between depression and COVID-19 recurrence and hospitalization.

Conclusion

The risk of COVID-19 recurrence and hospitalization in people who have anxiety, stress, or fear of the disease is six times higher than in other people. Therefore, designing and implementing appropriate strategies to prevent and control mental disorders can reduce COVID-19 recurrence and hospitalization. In addition, screening and effective treatment of stress and anxiety in these patients as well as improved post-discharge follow-up can have a positive effect on their health. Health policymakers should have a coherent plan to screen for emotional response indicators in COVID-19 patients. Given the prevalence of these indicators and the severity of anxiety in these patients, the use of psychological and psychiatric counseling services, either in-person or through telehealth, can be an effective method of monitoring and managing their clinical condition.

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Authors' Contribution

S.K, B.G: Study conception and design, data collection, and the draft of the manuscript. M.M S.M: Study design, review of the final version of the manuscript. Z.H, M.K, M.G, B.R, F.B: Data collection and review of the final version of the manuscript. S.B: Data analysis and interpretation. All authors have read and approved the final manuscript and agree to be accountable for all aspects of the work in ensuring that questions related to the accuracy or integrity of any part of the work are appropriately investigated and resolved.

Conflict of Interest

None declared.

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