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Predictors of anxiety, depression and health anxiety in COVID-19 infected patients with lung involvement in inpatient units

Faruk Karandere[1], Tacettin Kuru[2], Tayfun Kara[3]
[1] Department of Internal Medicine, University of Health Sciences, Bakirkoy Dr. Sadi Konuk Training and Research Hospital, Istanbul
[2] Department of Psychiatry, Alaaddin Keykubat University, Alanya Training and Research Hospital, Antalya
[3] Department of Child and Adolescent Psychiatry, Faculty of Medicine, Alanya Alaaddin Keykubat University, Antalya, Turkey

Abstract

Aim: Although numerous community-based studies and case reports have been published on COVID-19 and its psychological effects, studies involving hospitalized patients are limited. The purpose of the present study was to evaluate indicators associated with anxiety, depression, and health anxiety in patients with COVID-19 pneumonia.

Material and Methods: One hundred ninety-eight patients hospitalized with diagnoses of COVID-19 pneumonia were included in the study. Participants' sociodemographic characteristics and initial presentation variables were obtained from hospital records and information forms. Severity of lung involvement (SLI) was obtained from thoracic computed tomography (CT) records. The Hospital Anxiety and Depression Scale (HADS), and Whiteley Index-7 (WI-7) were applied to all participants.

Results: HADS-A levels were higher among female patients than among men (p=0.003). Higher WI-7 scores were determined in patients with mild SLI compared to those with moderate-severe SLI (p=0.012). HADS-A scores were higher in patients with primary symptoms of dyspnea, and HADS-D scores were higher in participants with primary symptoms of cough (p=0.026 and p=0.008, respectively).

Discussion: Female gender, severity of lung involvement, and symptoms of dyspnea and cough were identified as clinical indicators in terms of mental health evaluation. We think that our results will be a guide for determining the psychiatric support requirements of COVID-19 patients.

Keywords

COVID-19, Anxiety, Depression, Mental Health, Pandemic

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Corresponding Author: Tacettin Kuru, Oba District Fidanlık Street, Alanya, 07400, Antalya, Turkey.
E-mail: tkuru76@yahoo.com P: +90 505 386 95 49
Corresponding Author ORCID ID: https://orcid.org/0000-0002-0313-558X

Introduction

Coronavirus disease 2019 (COVID-19), caused by the new Coronavirus strain severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2), currently represents a pandemic. The COVID-19 outbreak was declared a public health emergency by the World Health Organization (2020) (WHO G. Statement on the second meeting of the International Health Regulations (2005) Emergency Committee regarding the outbreak of novel coronavirus (2019-nCoV). Published online 2020). Review studies have shown that COVID-19 not only threatens physical health, but also has an impact on mental health and well-being [1]. However, global interest has largely focused on psychological effects on the general population (for reasons such as quarantine, social restrictions, and impacts on economic well-being, education, and daily life) [2,3]. The diagnosis of COVID-19 has been linked to an increased incidence of new psychiatric diagnoses 14-90 days after treatment among individuals with no previous psychiatric histories [4]. Increasing post-traumatic stress symptoms (PTSS) and increased depression levels have been reported in patients following COVID-19 infection [5,6]. Case reports have observed elevated anxiety levels, suicide, and psychotic disorder during treatment in patients diagnosed with COVID-19 [7,8]. Female sex, a higher level of interleukin (IL)-1β, and greater self-perceived illness severity have been reported to be used for estimating the severity of psychiatric symptoms in patients hospitalized due to COVID-19 [9]. Follow-up studies have reported incidences of 28% for post-traumatic stress disorder (PTSD) in patients completing COVID-19 treatment, 31% for depression, 42% for anxiety, 20% for obsessive-compulsive (OC) symptoms, and 40% for insomnia findings. Overall, 56% of patients scored in the pathological range in at least one clinical dimension [10]. Psychiatric diseases in COVID-19 patients not only lead to mental outcomes, but also impact physical diseases. Anxiety in COVID-19 patients has been shown to be a risk factor for chronic diseases, such as hypertension [11]. Mental disorders associated with the COVID-19 pandemic have been reported to adversely affect treatment outcomes [12]. Identifying clinical risk factors that may give rise to the development of psychiatric disorder may therefore be useful in reducing short- and long-term effects on both the patient and the health care system. Although there have been numerous community-based studies and case reports on the psychological effects of COVID-19 disease, the number of studies involving inpatients is limited. The purpose of the present study was to evaluate the relationship between clinical indicators in patients hospitalized with a diagnosis of COVID-19 and with lung involvement, and anxiety, depression, and disease anxiety.

Material and Methods

Study population

Adult patients hospitalized at the by the Bakirkoy Dr. Sadi Konuk Training and Research Hospital with diagnoses of COVID-19 between 1 July and 15 August, 2020, were included in the study. All participants were positive for coronavirus disease with real-time reverse transcription-polymerase chain reaction analysis from nasopharyngeal swab or oropharyngeal swab specimens. All participants had thoracic computed tomography (CT) findings of COVID-19 infection. Patients meeting intensive care unit triage criteria (respiratory rate ≥30 / minute, oxygen saturation <93% despite nasal oxygen support of 5 l /min and above, partial oxygen pressure <60 mmHg despite nasal oxygen support of 5 l/ min and above, PaO2 / FiO2 <300, hypotension etc.) were excluded from the study. In addition, patients with premorbid psychiatric disorder and histories of mortality in the family due to the pandemic were also excluded from the study. Approval for the study was granted by the Bakirkoy Dr. Sadi Konuk Training and Research Hospital Clinical Research Ethical Committee on 22.06.2020 (decision no. 2020-13-12). All participants were interviewed in strict compliance with protective equipment and isolation rules. Written and verbal consent was obtained from all participants. Participants experiencing difficulty in reading and understanding forms or not completing the process were also removed from the study, which was finally completed with 198 individuals.

CT scan and imaging analysis

Thoracic CT scanning images were evaluated by pandemic hospital radiologists experienced in assessing thoracic imaging in the diagnosis of viral pneumonia in particular. If the patient underwent more than one CT scan during hospitalization, the scan with the most severe findings was included in the analysis. Patients were scanned with spiral CT on admission using a low-dosage, 64-slice, helical CT scanner (Somatom 64, Siemens Healthcare, Forchheim, Germany). Each of the five pulmonary lobes was evaluated using a scoring system of 1 (< 5% involvement), 2 (5–25% involvement), 3 (26–49% involvement), 4 (0–75% involvement), and 5 (>75% involvement). A total general lung score was calculated out of 25. Scores of 0-9 were regarded as mild lung involvement, 10-17 as moderate involvement, and 18-25 as severe involvement. Radiological findings of SARS-CoV-2 pneumonia were classified into three types, mild, moderate or severe involvement [13].

Psychometric instruments

Information concerning participants' sociodemographic characteristics (sex, education level, employment status, monthly income, history of smoking, chronic illness, etc.) was elicited using the prepared information form.

Hospital Anxiety Depression Scale (HADS); This 14-item scale was developed to identify anxiety and depression in the hospital environment. It contains two subscales - HADS-A for evaluating anxiety and HADS-D for depression. Both subscales consist of seven items scored between 0 and 3. Items 1, 3, 5, 6, 8, 10, 11 and 13 are scored 3, 2, 1 or 0, while items 2, 4, 7, 9, 12 and 14 are scored 0, 1, 2 or 3. Items 1, 3, 5, 7, 9, 11 and 13 are related to anxiety, while items 2, 4, 6, 8, 10, 12 and 14 are concerned with depression. Total scores range from 0 to 21 on both scales. The validity and reliability of the Turkish-language version were studied by Aydemir et al. [14]. In this study, the α coefficient was calculated as 0.80 for anxiety items and 0.75 for depression items.

Whiteley Index (WI-7); WI-7 is widely used to screen for somatization disorder, hypochondriasis, and health anxiety. The questions are answered either Yes or No. Each positive reply is scored 1, and each negative reply is scored 0. A total score between 0 and 7 is obtained. Higher scores indicate greater disease anxiety. The reliability and validity of the Turkish-

language version of the scale were studied by Güleç et al. [15]. Coefficient α for the WI-7 items in this study was calculated as 0.75.

Statistical analysis

Frequency and percentage values were calculated for categorical variables, while mean, standard deviation and median values were given for constant variables. The Kolmogorov-Smirnov test was used to assess normality of the distribution of constant variables. The Mann- Whitney U test was used in two-group comparisons of non-normally distributed variables. The Kruskal-Wallis test was used to compare more than two groups. Two-way evaluations of groups with statistical significance were performed using Dunn's multiple comparisons test with Bonferroni correction. The presence of correlation between scores representing continuous variables was assessed using Spearman's Rho correlation coefficient. P- values<.05 were regarded as statistically significant. Analyses were performed on ANCSS 11 (Number Cruncher Statistical System, 2017 Statistical Software) software and MedCalc Statistical Software version 18 (MedCalc Software bvba, Ostend, Belgium; http://www.medcalc.org; 2018).

Results

One hundred ninety-eight patients hospitalized with diagnoses of COVID-19 were included in the study. The mean age of the participants was 54.05±16.42. Ninety-two (46.5%) were men and 106 (53.5%) were women. Twenty patients (10.1%) were smokers. In terms of primary symptom distribution, the three most common were cough in 51 patients (25.8%), fever in 49 (24.7%), and fatigue in 36 (18.2%). Rare symptoms (such as sore throat, runny nose, diarrhea, loss of smell, and taste disturbance) were present in 13 (6.6%) patients. Severity of lung involvement (SLI) was mild in 101 cases (51.0%), moderate in 74 (37.4%), and severe in 23 (11.6%). Some cases exhibiting severe involvement could not be included in the study since they met the intensive care criteria. SLI was therefore divided into two groups: mild and moderate-severe. Patients reported the presence of symptoms for a mean 3.12±2.6 days prior to presentation. The mean length of hospitalization when patients were enrolled in the analysis was 9.03 ±6.77 days. When patients were compared in terms of HADS and WI-7 scale scores by gender, HADS-A levels were significantly higher among women than men (p=0.003). No significant gender difference was determined in terms of HADS-D (p=0.189) and WI-7 (p=0.058) scores. Comparison of scale scores based on education revealed a significant difference in terms of HADS-A (p=0.029). However, in two-way comparisons, the literacy only group exhibited significantly higher disease anxiety scores compared to the primary education group (p=0.006). When participants' occupations were compared in terms of scale scores, significant differences were observed between their HADS-A (p=0.008), HADS-D (p=0.027), and WI-7 (p=0.47) scores. However, in two-way comparisons, HADS-A (p=0.002) and WI-7 (p=0.007) values were significantly higher in the non-working group compared to the public employee group. Two-way comparison revealed no statistically significant difference in terms of HADS-D. No significant relationship was determined between participants' monthly income levels and HADS-A (p=0.417), HADS-D (p=0.240) and WI-7 (p=0.264) scores. No statistically significant difference was determined in terms of HADS-A, HADS-D, and WI-7 scores between participants with and without additional medical diseases (p=0.774, p=0.687, and p=0.075, respectively). No significant difference was also determined in HADS-A, HADS-D, and WI-7 scores between smokers and non-smokers (p=0.264, p=0.277, and p=0.152, respectively) (Table 1).

Significantly higher WI-7 scores were determined in patients with mild lung involvement than in those with moderate-

Table 1. Comparison of scale scores in terms of the distribution of sociodemographic characteristics

		HADS-A Mean (Std) (Min-Max)	HADS-D Mean (Std) Median (Min-Max)	WI-7 Mean (Std) Median (Min-Max)
Sex	Female (92)	7.217 ±4.442	7.478 ±4.421	2.717 ± 2.012
		7 (0-18)	7 (0-19)	3 (0-7)
	Male (106)	5.377 ± 3.688	6.717 ±4.435	2.235 ±2.104
		5 (0-19)	6 (0-21)	2 (0-7)
		p=0.003*	p=0.189*	p=0.058*
Education Level	Literate (32)	7.718 ±4.608	7.531 ±3.801	3.375 ±2.028
		8 (0-18)	8 (1-16)	3 (0-7)
	Primary (116)	6.112 ±4.081	7.025 ±4.639	2.258 ±1.987
		5.5 (0-19)	6.5 (0-21	2 (0-7)
	High School (33)	5.606 ±3.840	6.969 ±4.660	2.545 ±2.180
		5 (0-15)	6 (0-19)	2 (0-7)
	University or Higher (17)	5.470 ±3.954	6.705 ±3.917	1.941 ±2.164
		5 (0-16)	6 (2-13)	1 (0-7)
		p=0.155**	p=0.792**	p=0.029**
Employment Status	Unemployed-Housewife (88)	7.295 ±4.394	8.023 ±4.482	2.818 ±2.008
		7 (0-18)	8 (0-19)	3 (0-7)
	Self-Employed (62)	5.564 ±3.704	6.564 ±4.433	2.290 ±2.067
		5 (0-19)	6 (0-21)	2 (0-7)
	Public Employee (25)	4.240 ±2.947	5.640 ±4.424	1.640 ±1.800
		5 (0-9)	4 (0-14)	1 (0-7)
	Retired (23)	6.130 ± 4.465	6.347 ±3.676	2.434 ±2.389
		5 (1-15)	6 (0-13)	2 (0-7)
		p=0.008**	p =0.027**	p =0.047**
Monthly Income	≥1MW (102)	6.608 ±4.358	7.255 ±4.496	2.696 ±2.038
		6 (0-18)	7 (0-19)	3 (0-7)
	1-2MW (76)	6.026 ±4.036	7.223 ±4.574	2.302 ±2.197
		5.5 (0-19)	7 (0-21)	2 (0-7)
	2-4MW (18)	5.333 ±3.343	5.944 ±3.208	1.833 ±1.689
		5 (0-15)	5.5 (2-13)	2 (0-5)
	4 MW≤ (2)	3.000 ±2.828	2 ±2.828	2 ±.000
		3(1-5)	2 (0-4)	2(2-2)
		p=0.417**	p=0.240**	p=0.264**
Chronic Illness	No (122)	6.139± 4.120	7.164 ±4.562	2.262± 2.064
		5.5 (0-19)	7 (0-21)	2 (0-7)
	Yes (76)	6.381± 4.217	6.921 ±4.245	2.776± 2.056
		5.5 (0-16)	6 (0-19)	2 (0-7)
		p=0.774*	p=0.687*	p=0.075*
History of Smoking	No (178)	6.084 ± 3.992	6.905 ± 4.294	2.399± 2.081
		5. (0-18)	7 (0-19)	2 (0-7)
	Yes (20)	7.550±5.286	8.550± 5.434	3± 1.947
		7 (0-19)	6 (0-21)	3 (0-7)
		p= 0.264*	p=0.277*	p=0.152*

Kruskal-Wallis Test** and Mann-Whitney U Test*, Hospital Anxiety and Depression Scale (HADS), minimum wage (MW), Variables with p < .05 are shown in bold, Whiteley Index (WI-7)

severe involvement (p=0.012). No significant difference was determined in HADS-A and HADS-D scale scores in terms of SLI distribution (p=0.054, and p=0.270). Analysis of primary symptom distribution and scale scores revealed significantly higher HADS-A scores in patients with dyspnea (p=0.026), while HADS-D scores were significantly higher among patients with primary symptoms of cough (p=0.008). No significant relationship was found between symptoms and scale scores in patients with primary symptoms of fever, joint and muscle pain (Table 2).

Table 2. Comparison of the scale scores in terms of COVID-19 parameters

	n	HADS-A Mean (Std) Median (Min-Max)	HADS-D Mean (Std) Median (Min-Max)	WI-7 Mean (Std) Median (Min-Max)
SLI	Mild (101)	6.723 ±4.094	7.317 ±4.171	2.772 ±1.989
		6 (0-18)	7 (0-19)	3 (0-7)
	Moderate-severe (97)	5.721± 4.165	6.814 ±4.700	2.134 ±2.114
		5 (0-19)	6 (0-21)	2 (0-7)
		p=0.054	p=0.270	p=0.012
Dyspnea	No (165)	5.927 ±4.030	6.988 ±4.456	2.4± 2.123
		5 (0-18)	7 (0-19)	2 (0-7)
	Yes (33)	7.758± 4.458	7.484± 4.367	2.757 ±1.786
		7 (0-19)	7 (0-21)	2 (0-7)
		p=0.026	p=0.521	p=0.221
Cough	No (139)	6.108 ±4.216	6.554± 4.474	2.396± 2.135
		6 (0-19)	6 (0-21)	2 (0-7)
	Yes (59)	6.525 ± 4.006	8.288± 4.12332	2.610 ± 1.921
		5 (0-15)	8 (0-19)	2 (0-7
		p=0.546	p=0.008	p=0.350
Fever	No (135)	6.430 ± 4.247	7.392 ± 4.557	2.630 ± 2.072
		6 (0-19)	7 (0-21)	2 (0-7)
	Yes (63)	5.810± 3.930	6.381 ± 4.109	2.095± 2.038
		5 (0-16)	6 (0-19)	2 (0-7)
		p=0.354	p=0.115	p=0.072
Fatigue	No (152)	6.263± 4.165	7.270± 4.447	2.382 ± 2.020
		5 (0-19)	7 (0-21)	2 (0-7)
	Yes (46)	6.1304± 4.140	6.413± 4.375	2.717 ± 2.238
		6 (0-18)	6 (0-14)	3 (0-7)
		p=0.941	p=0.316	p=0.398
Myalgia	No (159)	5.967 ± 3.823	7.044± 4.333	2.440± 2.061
		5 (0-18)	7. (0-19)	2 (0-7)
	Yes (39)	7.308 ± 5.197	7.179± 4.882	2.539 ± 2.138
		8 (0-19)	7 (0-21)	3 (0-7)
		p=0.162	p=0.990	p=0.787

Mann-Whitney U Test, Hospital Anxiety and Depression Scale (HADS), minimum wage (MW), Whiteley Index (WI-7), severity of lung involvement (SLI), Variables with p < .05 are shown in bold.

Correlation analysis revealed significant positive correlation between the age variable and SLI score and length of hospitalization (rho=0.178, p=0.012 and rho=0.327, p<0.001, respectively). Additionally, WI-7 scores were significantly negatively correlated with SLI scores (rho=-167, p=0.019). As expected, significant positive correlations were observed between HADS-A and HADS-D (rho=0.567, p<0.001), HADS-A and WI-7 scores (rho=0.429, p<0.001), and HADS-D and WI-7 scores (rho=0.286, p<0.001). Significant positive correlation was also determined between SLI score and length of hospitalization (rho=0.271, p<0.001) (Table 3).

Discussion

The results of this study identified various clinical indicators acting as risk factors in mental health in patients diagnosed with COVID-19. These factors are important because new problems are being encountered in mental health services for patients hospitalized during the COVID-19 pandemic, such as risk of transmission, patient isolation, and limited visiting. Female gender, severity of lung involvement, and dyspnea and cough were identified as important clinical indicators in the evaluation of patients' mental health. Findings from community-based studies show that women experience more severe anxiety symptoms during the COVID-19 pandemic than men [16]. Studies have reported a greater likelihood of anxiety in female patients than in males [9,10]. Anxiety levels were also higher in female patients with lung involvement in the present study. Although higher rates of depression have been reported in female patients in studies involving COVID-19 patients, no statistically significant difference was observed in the present study [10]. We attributed this increased anxiety to the possibility

Table 3. Comparison of the scale scores in terms of clinical parameters

0		Age	Disease duration (days)	Hospital stay (days)	SLI	HADS-A	HADS-D	WI-7
Age	rho	1						
	p	.						
Disease duration (days)	rho	-0.054	1					
	p	0.450	.					
Hospital stay (days)	rho	0.327**	-0.019	1				
	p	0.000	0.785	.				
SLI	rho	0.178*	0.046	0.271**	1			
	p	0.012	0.519	0.000	.			
HADS-A	rho	0.098	0.003	-0.029	-0.127	1		
	p	0.171	0.970	0.681	0.074	.		
HADS-D	rho	0.071	-0.024	0.012	-0.062	0.565**	1	
	p	0.318	0.739	0.868	0.384	0.000	.	
WI-7	rho	0.091	-0.050	0.023	-0.167*	0.429**	0.286**	1
	p	0.201	0.485	0.749	0.019	0.000	0.000	.

*p<0.05, **P<0.01. Spearman's Rho Correlation, severity of lung involvement (SLI), Hospital Anxiety and Depression Scale (HADS), minimum wage (MW), Variables with p < .05 are shown in bold, Whiteley Index (WI-7), Disease duration: time with symptoms before admission to hospital

that women are more affected by traumatic events [17]. Both cough and dyspnea can result in severe emotional difficulty and prevent daily functioning. Depression and anxiety disorders are known to be more prevalent, and adversely affect the prognosis in patients with chronic obstructive pulmonary disease with symptoms of cough and dyspnea compared to the general population [18]. Indeed, depression in these patient groups has been reported to be more associated with cough than chronic lung disease [19]. Air hunger has been reported to be capable of triggering anxiety [20]. Dyspnea is a distressing sensation capable of causing psychological trauma. Air hunger has been linked to PTSD, anxiety and depression [21]. Cross-sectional and longitudinal studies have shown that severe dyspnea is associated with greater depressive symptoms [22]. Greater anxiety was observed in the group with dyspnea as the leading symptom in this study, and greater depressive symptoms in the group with cough as the main symptom. As shown in the literature, air hunger triggers anxiety, and we thought that physical discomfort and concerns over stigmatization may also trigger depression in patients. Patients with mild lung involvement registered higher WI-7 scores in the present study. We also observed negative correlation between SLI and WI-7 scores. The WI-7 scale is employed in the evaluation of characteristic such as "bodily preoccupation," and "disease fear or worrying" in the examination of such psychiatric diagnoses as somatization and hypochondriasis [23]. The COVID-19 pandemic has been shown to cause public panic and hypochondria, and an increase in appropriate health search behavior and demands for health services [24]. We also thought that hypochondriacal suspicion may result in an increased desire to access health services. This may perhaps have resulted in patients being diagnosed without progression of lung involvement. The burden placed on health services by individuals with hypochondriacal suspicion must also, of course, not be ignored.

This study has a number of limitations that are difficult to eliminate during a pandemic. They follow from the compulsory isolation conditions. Due to limited contact with COVID-19 patients, the study was performed only with patients in the hospital's isolation ward, and the study sample involved a single hospital. Due to the size of the study sample, it was not possible to evaluate rare COVID-19 symptoms. Additionally, due to the cross-sectional nature of the present study, we were unable to observe patients' mental health symptoms in a dynamic manner, and data were only obtained during visits.

Conclusion

The present study identified various clinical indicators acting as risk factors in terms of effects on the mental health of patients diagnosed with COVID-19. Female gender, severity of lung involvement, and dyspnea and cough symptoms were identified as important clinical determinants in the evaluation of patients' mental health. We think that our findings will be a useful guide to determining psychiatric support requirements in COVID-19 patients.

Scientific Responsibility Statement

The authors declare that they are responsible for the article's scientific content including study design, data collection, analysis and interpretation, writing, some of the main line, or all of the preparation and scientific review of the contents and approval of the final version of the article.

Animal and human rights statement

All procedures performed in this study were in accordance with the ethical standards of the institutional and/or national research committee and with the 1964 Helsinki declaration and its later amendments or comparable ethical standards. No animal or human studies were carried out by the authors for this article.

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Conflict of interest

None of the authors received any type of financial support that could be considered potential conflict of interest regarding the manuscript or its submission.

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