


# Treatment adherence and anxiety levels of bronchiectasis patients in the COVID-19 pandemic

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## Abstract

It has been reported that during the coronavirus disease-2019 (COVID-19) pandemic, bronchiectasis patients were adversely affected due to their limited respiratory functions and acute exacerbations which were triggered by viral infections. The increased concern in the population during the pandemic has affected the attitudes of people toward avoiding disease and patients' treatment compliance. It is unclear whether treatment adherence and anxiety levels of bronchiectasis patients have changed during the pandemic. We aimed to evaluate treatment adherence and anxiety levels in patients with bronchiectasis. A cross-sectional survey was conducted between May and November 2021. A total of 123 patients with bronchiectasis and 110 adults without chronic diseases were included in the control group. Patient demographic information, bronchiectasis follow-up data, and COVID-19 history were recorded. Then, patients filled out "MARS-5 Index" (Medical Adherence Report Scale-5), Beck Anxiety Scale and the Effect of Events Scale (IES-R). Responses of questionnaires were statistically analyzed. Our results showed that the majority of patients with bronchiectasis had high Medical Adherence Report Scale-5 index total scores during the COVID-19 pandemic (86.2%). The total scores on the Beck Anxiety Scale of bronchiectasis patients who did not have COVID-19 were significantly higher than those who had COVID-19 ( $P = .04$ ). The total scores on the IES-R were found to be significantly higher in the control group ( $P < .001$ ). No significant difference was found in the total scores on the Beck Anxiety Scale between the patients and the control group. The bronchiectasis patients had high adherence to their current treatment during the COVID-19 period and were less affected by the pandemic and its psychological effects compared to the healthy population. Furthermore, individuals diagnosed with bronchiectasis who were not infected with COVID-19 demonstrated increased levels of anxiety compared to those who were infected with COVID-19 which may be due to their concern about contracting the disease.

**Abbreviations:** COVID-19 = coronavirus disease-2019, IES-R = effect of events scale-revised.

**Keywords:** anxiety, bronchiectasis, COVID-19

## 1. Introduction

During the Coronavirus disease-2019 (COVID-19) pandemic, patients with chronic lung diseases such as Chronic Obstructive Pulmonary Disease, interstitial lung disease, and bronchiectasis were more affected than the healthy population.<sup>[1-4]</sup> Although the COVID-19 pandemic has lost its severity, SARS-CoV-2 viral infection seems to occur in our lives from now on, similar to other respiratory tract viral infections.

It has been reported in the literature that there is a decrease in bronchiectasis exacerbations, mostly due to social distancing rules and the decrease in other respiratory tract viruses after lockdown. However, no changes were observed in the

symptoms of the patients.<sup>[5,6]</sup> In contrast, Qin et al reported that the number of acute exacerbations increased during a 1-year follow-up of bronchiectasis during the COVID-19 pandemic.<sup>[7]</sup>

Patients with bronchiectasis are adversely affected by SARS-CoV-2 infection owing to limited respiratory function and acute exacerbations triggered by viral infections.<sup>[6,7]</sup> While parameters such as symptoms, acute exacerbation rates, pulmonary function tests, and sputum samples of bronchiectasis patients during the pandemic period were investigated, the treatment adherence of patients and their anxiety levels were unknown.

The authors have no funding and conflicts of interest to disclose.

The datasets generated during and/or analyzed during the current study are not publicly available, but are available from the corresponding author on reasonable request.

Supplemental Digital Content is available for this article.

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How to cite this article: Borekci S, Vardaloglu I, Gungordu N, Caliskaner Ozturk B, Culpan HC, Aksoy Poyraz C, Gemicioglu B. Treatment adherence and anxiety levels of bronchiectasis patients in the COVID-19 pandemic. *Medicine* 2023;102:19(e33716).

Received: 9 March 2023 / Received in final form: 14 April 2023 / Accepted: 18 April 2023

<http://dx.doi.org/10.1097/MD.00000000000033716>

This study aimed to evaluate the treatment adherence and anxiety levels of patients with bronchiectasis during the COVID-19 pandemic.

## 2. Material and method

### 2.1. Study setting

A single-center, cross-sectional survey study was conducted at a university hospital pulmonology outpatient clinic between May 2021 and November 2021.

### 2.2. Data collection and variables

All patients were informed of the study by a single physician. After informed consent was obtained, patients' demographic information, comorbidities, medications, duration of disease, and COVID-19 history during the pandemic period were recorded. Treatment adherence and patients' anxiety levels were assessed by MARS the Medical Adherence Report Scale (MARS), Beck Anxiety Scale, and Impact of Events Scale-Revised (IES-R). The survey responses were noted and analyzed.

### 2.3. Participants

Patients who had admitted to bronchiectasis outpatient clinic between May 2021 and November 2021 were selected by consecutive sampling method. Bronchiectasis diagnosis was performed radiologically using computed tomography. A total of 110 individuals with no chronic diseases were included in the control group.

### 2.4. Inclusion criteria

- Having the radiological bronchiectasis diagnosis.
- Being older than 18 years.
- Being able to understand and answer survey questions.

### 2.5. Exclusion criteria

- Having cystic fibrosis diagnosis.
- Being under 18 years.
- Patients who are not able to understand survey questions.

### 2.6. Surveys and scales

**1.2.6.. Beck anxiety scale.** The Beck Anxiety Scale, described by Beck et al, is a self-assessment scale that evaluates individuals'

anxiety symptoms and their frequency.<sup>[8]</sup> To 8 to 15 points were mild, to 16 to 25 points were moderate and to 26 to 63 points were defined as severe anxiety. It is a Likert-type scale consisting of 21 items and rated between 0 and 3. Ulusoy et al conducted a validity and reliability assessment in Turkey.<sup>[9]</sup>

**2.2.6.. Impact of events-revised (IES-R).** The IES-R is a 5 likert type scale that consists of 22 items that aim to define the stress levels of individuals who had previous trauma. Scores of more than 37 were accepted as significantly high. The validity and reliability of the IES-R have been evaluated and it is commonly used in clinical studies to determine post-traumatic stress disorders.<sup>[10]</sup> Turkish validity and reliability were assessed by Çorapçioğlu et al.<sup>[11]</sup>

**3.2.6.. Medication adherence rating scale (MARS)-5.** "Medication Adherence Rating Scale-5 (MARS)" is a 5 likert type scale which aims to determine patients' adherence and behavior to medications. This scale can be used to evaluate treatment adherence for diseases such as hypertension, diabetes mellitus, asthma, chronic obstructive lung disease and psychiatric diseases.<sup>[12,13]</sup> Patients were asked about the frequency of occurrence of 5 events, and points were added to achieve a total score (1 = very frequently, 2 = frequently, 3 = occasionally, 4 = rarely, and 5 = never). While scores between 21 and 25 illustrates medication adherence, scores under 20 indicate insufficient adherence. Turkish validity and reliability were assessed by Şen et al.<sup>[14]</sup>

### 2.7. Statistical analysis

SPSS v21.0 (SPSS Inc., Chicago, IL) was used for the statistical analysis. Kruskal–Wallis and Shapiro–Wilk tests were used to assess normal distribution. For categorical variables, the difference between groups chi-square test and Fisher exact test were used to assess the difference between groups. For continuous variables, when normal distribution was achieved, an independent group t-test was used; when normal distribution was not achieved, the Mann–Whitney U test was used. To be able to adjust by sex, the analyzes were reperformed after the data was layered by sex. Spearman correlation was used to asses association between each scale in bronchiectasis and control group. Statistical significance was set at  $P < .05$ .

### 2.8. Ethical approval, informed consent and permissions

This study was approved by the Ethics Committee of the university (date:26.01.2021, No:12160). Oral and written informed consent was obtained from all the participants.

**Table 1**

**Demographic characteristics and COVID-19 history of bronchiectasis patients.**

	All (n = 123)	COVID-19 (-) (n = 99)	COVID-19 (+) (n = 24)	P value
Sex				.024*
Female	76 (61.8)	66 (66.7)	10 (41.7)	
Male	47 (38.2)	33 (33.3)	14 (58.3)	
Age	44.8 ± 16.2	46.1 ± 16.9	39.3 ± 11.8	.025†
	42 (31–58)	44 (32–60)	38.5 (27.8–46.3)	
BMI	25.2 ± 5	25.2 ± 5.2	25 ± 4	.829†
	24.8 (21.8–28.1)	24.3 (21.6–28.1)	25.7 (22.5–27.9)	

BMI = body-mass index, COVID-19 = coronavirus disease-2019.

\*Chi-square test.

†Student t test.

### 3. Results

#### 3.1. Demographics and descriptive data

One hundred twenty-three patients were included in the study. Most of the 123 patients included in the study was female (61.8%). The mean age of patients was  $44.8 \pm 16.2$  and the mean body mass index was  $25.2 \pm 5$ . Male bronchiectasis patients had a higher rate of history of COVID-19 (58.3%) ( $P = .024$ ) (Table 1). Among the 24 patients with bronchiectasis who had COVID-19 infection, 4 (16.7%) were admitted to the hospital; none of them had a history of intubation (Table 2).

Of the 110 patients in the control group, 64% ( $n = 71$ ) were female. A total of 79.2% of the healthy individuals with a history of COVID-19 were female. In the control group, there were no statistically significant differences in terms of age ( $P = .39$ ), sex ( $P = .09$ ), and body mass index ( $P = .62$ ) between individuals with COVID-19 history ( $n = 24$ ) and those without a history ( $n = 86$ ).

Twenty-two percent of the control group and nineteen percent of the yield any statistically significant difference ( $P = .66$ ). Bronchiectasis patients were infected with COVID-19. The comparison between 2 groups did not

#### 3.2. Survey and scale responses of bronchiectasis patients

When the MARS survey scores, which evaluate bronchiectasis patients' treatment adherence, were investigated, the mean total scores were found to be  $22.6 \pm 4.4$  and no significant difference was found between patients with COVID-19 history and patients without COVID history ( $P = .32$ ). The MARS total scores of bronchiectasis patients showed that 86.2% of the patients had high treatment adherence. The total Beck Anxiety

**Table 2**  
Characteristics of bronchiectasis patients with COVID-19 history.

	n	%
In patient/ICU admission	4	16.7%
Need of oxygen support	1	4.2%
Mechanical ventilation support	0	0
Intubation	0	0
Increase in secretion	8	33.3%
Color change in secretion	3	12.5%

COVID-19 = coronavirus disease-2019, ICU = intensive care unit.

**Table 3**  
Survey response distribution of bronchiectasis patients according to COVID-19 history.

	All	COVID-19 (-)	COVID-19 (+)	P value
	(n = 123)	(n = 99)	(n = 24)	
MARS, total mean score	$22.6 \pm 4.4$	$22.5 \pm 4.4$	$23 \pm 4.4$	.322*
MARS, total score				.834†
≤20	17 (13.8)	14 (14.1)	3 (12.5)	
>20	106 (86.2)	85 (85.9)	21 (87.5)	
Beck anxiety scale				.041‡
0–7 point(s)	62 (50.4)	50 (50.5)	12 (50)	
Mild	31 (25.2)	21 (21.2)	10 (41.7)	
Moderate	17 (13.8)	17 (17.2)	0	
Severe	13 (10.6)	11 (11.1)	2 (8.3)	
IES-R total mean score	$13.9 \pm 16.6$	$15 \pm 17.6$	$9.4 \pm 10.5$	.240*

COVID-19 = coronavirus disease-2019, IES-R = impact of event scale-revised, MARS = medical adherence report scale-5.

\*Mann-Whitney U test.

†Chi-square test.

‡Fisher Exact test.

Scale scores were significantly higher in bronchiectasis patients with no COVID-19 history ( $P = .04$ ) (Table 3).

The Impact of Events Scale (IES-R) showed no statistically significant difference between the 2 groups (Table 3).

Due to unbalanced distribution in gender, gender adjusted analysis were done for each scale. There was no significant difference between bronchiectasis and control groups (Supplementary Table 2, <http://links.lww.com/MD/I943>).

#### 3.3. Disease course of bronchiectasis patients during COVID-19 pandemics

Mean exacerbation rate of bronchiectasis patients during COVID-19 pandemics was  $1.8 \pm 2.1$  and there was no statistically significant difference between patients with COVID-19 history and patients without COVID-19 history. Of the patients, 72.2% ( $n = 39$ ) had hospital admissions during the pandemic period, 47.2% had ongoing treatment, and 98.3% adhered to their treatment during the pandemic period. 79% of patients with COVID-19 history had other COVID-19 patients in close proximity (Supplementary Table 1, <http://links.lww.com/MD/I944>).

#### 3.4. Comparison of bronchiectasis and control group

When the scale results of the bronchiectasis and control group were compared, no statistically significant difference was found in the total scores of Beck Anxiety Scale ( $P = .67$ ). The mean total scores on the IES-R were significantly lower in the bronchiectasis group as compared to the control group ( $P < .001$ ) (Table 4).

In bronchiectasis patients, the correlation between MARS and Beck Anxiety Scale as well as IES-R was not found to be significant ( $r = -0.074$ ,  $P = .41$ ,  $r = -0.076$ ,  $P = .40$ ).

### 4. Discussion

This study showed that bronchiectasis patients had high adherence to their current treatment during the COVID-19 period and were less affected by the pandemic and its psychological effects compared to the healthy population, additionally anxiety levels of bronchiectasis patients did not differ significantly from those of healthy controls. Bronchiectasis patients who were not infected with COVID-19 displayed increased levels of anxiety when compared to those who infected with the virus.

**Table 4****Comparison of the survey results of bronchiectasis patients and control group.**

	All (n = 233)	Control (n = 110)	Bronchiectasis (n = 123)	P value
Beck anxiety scale, mean total score	9.8 ± 10.7	9.1 ± 9.3	10.5 ± 11.7	.668*
Beck anxiety scale, total score				.716†
0–7 point(s)	120 (51.5)	58 (52.7)	62 (50.4)	
Mild	61 (26.2)	30 (27.3)	31 (25.2)	
Moderate	32 (13.7)	15 (13.6)	17 (13.8)	
Severe	20 (8.6)	7 (6.4)	13 (10.6)	
Impact of event scale-revised (IES-R)	16.1 ± 15.4	18.5 ± 13.6	13.9 ± 16.6	<.001*

\*Mann–Whitney *U* test.

†Chi-square test.

The increased anxiety levels of bronchiectasis patients who have not been infected with COVID-19 can be interpreted in 2 ways. As they have not been infected with COVID-19, it is plausible that they may have concerns of contracting the disease. On the other-hand their anxiety levels may have served as a protecting factor against contracting COVID-19. Further studies are necessary to clarify whether disease avoidance attitudes or different mechanisms are effective in this regard.

Compliance with treatment for chronic diseases can be affected by several factors.<sup>[15,16]</sup> It is unknown how the treatment adherence of bronchiectasis patients with chronic diseases is affected during the COVID-19 pandemic. When the total scores of the Medical Adherence Report Scale-5 index were examined, it was determined that a significant majority of individuals diagnosed with bronchiectasis, specifically 86.2% demonstrated a considerable degree of compliance with their treatment protocol. This may be due to the high awareness of respiratory tract viral infections due to frequent acute exacerbations in bronchiectasis patients.

During the COVID-19 pandemic, which mostly affects the respiratory tract, it is expected that the anxiety levels of those with chronic lung disease will increase, and the increased anxiety will affect the behaviors of individuals in different ways.<sup>[17]</sup> There are no studies in the literature examining the anxiety level of patients with bronchiectasis during the COVID-19 pandemic. Our study revealed that there was no significant difference observed in the level of anxiety between patients and controls.

Although, the bronchiectasis patients with no COVID-19 history showed significantly higher total scores of Beck Anxiety Scale; the significance has lost when sex adjusted analysis were done. This result can be explained by the lower sample size when it divided 2 groups of sex.

Previous studies have reported that patients with bronchiectasis had fewer exacerbations during the COVID-19 pandemic.<sup>[5,18]</sup> Among the bronchiectasis patients examined in our study, the mean number of exacerbations in a 1-year period was found to be 1.8 ± 2.1. The fact that 57 (98.3%) of 58 patients with a treatment stated that they continued their current treatment, indicating that our patients were committed to their treatment. Continuation of follow-up and treatment of the patients may have ensured that the frequency of exacerbations did not increase.

The pandemic has left mental trauma-like effects on society.<sup>[19]</sup> No studies have investigated the post-traumatic effects of the pandemic on patients with bronchiectasis. In our study, when bronchiectasis patients and control groups were compared, the Impact of Events Scale total scores were lower in bronchiectasis patients. This situation can be explained by the fact that patients with bronchiectasis are familiar with COVID -19 respiratory symptoms because of their previous exacerbations; therefore, the pandemic caused less post-traumatic effect.

The reason why there was no significant correlation between the MARS index and the Beck Anxiety Scale or IES-R in bronchiectasis patients may be due to the fact that all patients included in the study were regularly followed up in the specialized bronchiectasis outpatient clinic and they had sufficient knowledge and education about their disease and treatment. Therefore, the treatment adherence was high in most of individuals.

The limitation of the study was since it is a cross-sectional single-center study, generalization of a larger population cannot be done.

The strength of our study is that, unlike other studies in the literature, this is the first study to evaluate the treatment adherence and psychiatric symptoms of bronchiectasis patients using objective scales and to compare it with healthy adults. The results of our study emphasize the importance of evaluating bronchiectasis patients with their psychosocial features. This can guide physicians to ensure patients' adherence to treatment.

## 5. Conclusion

Our study revealed that bronchiectasis patients had higher adherence to their current treatment during the COVID-19 period and were less affected by the pandemic and its psychological effects compared to the healthy population. Additionally, bronchiectasis patients who were not afflicted with COVID-19 displayed increased levels of anxiety when compared to those who did contract the virus which may which may be due to their concern about contracting the disease.

## Author contributions

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