Clinical characteristics and outcome of COVID-19 patients with non cystic fibrosis bronchiectasis

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**Additional Declarations:** (Not answered)
Clinical characteristics and outcome of COVID-19 patients with non cystic fibrosis bronchiectasis

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Abstract

Introduction: Non cystic fibrosis bronchiectasis is an uncommon respiratory disease and was described as a rare imaging feature of COVID-19 infection, but no published studies are reporting the clinical course and outcome of coexisting COVID-19 and confirmed cases of bronchiectasis during acute stage. The aim of this study was to assess the course and outcome of COVID-19 infection in bronchiectasis patient. Patients and methods: A cross-sectional study including 411 COVID-19 confirmed cases that were examined by high resolution computed tomography of the chest during acute phase (4 weeks) of the infection. They were divided into Group A: COVID-19 patients without bronchiectasis (n=400) and Group B included COVID-19 patients with preexisting clinical and radiologic evidence of bronchiectasis (n=11). Results: Patients with preexisting chronic bronchiectasis (Grup B) had significantly higher cough score, frequency of colored sputum and mMRC score, respiratory distress ($p< 0.001$) and respiratory failure ($p= 0.02$) than those without bronchiectasis. They also had the higher frequency of ICU’s admission ($p< 0.001$), need to non-invasive ($p= 0.01$), and invasive mechanical ventilation ($p= <0.001$), duration of mechanical ventilation, ICU’s stay and overall hospital stay ($p<0.001$). Death rate was also statistically significantly
higher in Group B compared to Group A ($p = 0.04$). **Conclusion:** Concomitant bronchiectasis increases disease burden in COVID-19 patients. It increased the severity of presenting symptoms and was associated with worse clinical outcome (ICU admission, need for ventilator support) and mortality.

**Keywords:** COVID-19; non-cystic fibrosis bronchiectasis; bronchiectasis; clinical; outcome.

**Introduction**

Since December 2019, WHO estimated that over 600 million confirmed cases of COVID-19 and over 7 million deaths have been reported globally.(1-2) The typical chest CT findings of COVID-19 pneumonia is bilateral peripheral ground-glass opacities (GGO), sometimes with areas of consolidation, with a prominent lower lung distribution. (3-4)

Meanwhile, non-cystic fibrosis bronchiectasis is a chronic lung condition, characterized clinically by dyspnea, excessive sputum, cough, and recurrent respiratory infections with radiological abnormal and permanent dilatation of the bronchi. The main diagnostic features of bronchiectasis in chest HRCT are: 1) Bronchial internal diameter wider than the adjacent pulmonary artery; 2) failure of tapering of the bronchi; and 3) visualization of bronchi in the outer 1–2 cm of lung fields.(5) It was described as a possible yet rare imaging feature of COVID-19 pneumonia, but no published studies are reporting the onset and evolution of bronchiectasis during the short follow-up in a patient with this disease.(6)

**This study aims to** assess the clinical features and outcome of acute COVID-19 infection in patient with preexisting bronchiectasis.
Patients and methods

A cross-sectional study has been conducted at 2 local hospitals during the second and third waves of COVID-19 (July 2021 to February 2022). All participants were diagnosed with COVID-19 according to the WHO and Egyptian Ministry of Health and Population (MOHP) definitions.(7) (8) Diagnosis of the cases was confirmed using RT-PCR for detection of the viral RNA by TaqMan™ 2019-nCoV Control Kit v1 (Cat. No. A47532) supplied by QIAGEN, Germany on the Applied Biosystem 7500 Fast RT PCR System, USA. It was a total coverage sample included all cases admitted during the study period in study hospitals.

The inclusion criteria were adult patients aged 18 years or older, of both genders who were diagnosed as COVID-19 positive by RT-PCR and had chest HRCT scan during acute stage of the diseases. Children under 18 years old, patients who were not examined by chest HRCT and those who refused to participate in the study were excluded. COVID-19 patients with no previous history of bronchiectasis with newly developed cavitation were also excluded (Figure 1).

Data Collection:

All patients included in this study were subjected to detailed history and physical examination, routine laboratory investigations, inflammatory markers, arterial blood gas analysis, as well as chest HRCT.

The computed tomography was performed using GE Optima 64 slices made in USA. All chest HRCT were examined and revised by two independent radiologists who were blinded to the study. The images of each patient were assessed for the presence and distribution of parenchymal abnormalities, including ground-glass opacities (GGO), consolidation, distribution of lesion (peripheral or
diffuse), crazy paving pattern, septal thickening, pulmonary nodules, mediastinal lymph nodes and pleural effusion for the diagnosis of COVID-19 infection and assessment of its severity. They also were assessed for the presence of any signs of bronchiectasis with evaluation of its anatomical distribution.

Based on the clinical and radiological evidence of pre-existing bronchiectasis, patients were subdivided into 2 groups:

- Group A included COVID-19 patients without bronchiectasis (n=400).
- Group B included COVID-19 patients with preexisting clinical and radiologic evidence of non-cystic fibrosis bronchiectasis (n=11).

**Ethical approval:**

The study protocol was approved by the ethical committee of the Faculty of Medicine, Assiut University (IRB no.17101456). The signed informed consent form was obtained from participants of the study, and it was kept in each record. Patients identifying information were concealed and each patient assigned for a code to insure privacy and confidentiality of the data. It was conducted in accordance with the provisions of the Declaration of Helsinki. The study was also registered in clinicaltrials.gov under number (NCT04910113).

**Statistical analysis:**

Data was collected and analyzed by using SPSS (Statistical Package for the Social Science, version 20, IBM, and Armonk, New York). The Shapiro test was used to determine compliance of the data to normal distribution. All quantitative data in the current study had abnormal distribution and compared with Mann
Whitney test. Nominal data were given as number (n) and percentage (%). Chi² test was implemented on such data. P value was considered significant if < 0.05.

Results

A total of 425 patients with confirmed COVID-19 infection were enrolled in the current study. Fourteen COVID-19 patients with no previous history of bronchiectasis with newly developed cavitation were excluded. Based on presence and previous history of confirmed HRCT non cystic-pulmonary fibrosis bronchiectasis, those patients were subdivided into the following groups:

- Group A: COVID-19 patients without bronchiectasis, 400 (97.3%) patients,
- Group B: COVID-19 patients with previous clinical and radiologic evidence of non- cystic pulmonary fibrosis bronchiectasis, 11 (2.7%) patients. The flowchart of recruited cases is shown in (Figure 1).

The mean age of the patients in the two groups were 52.62 ± 17.80 and 52.64 ± 24.08 years respectively and more than half of them were males. Patients with preexisting chronic bronchiectasis (Group B) had significantly higher frequency of COPD in comparison to those without bronchiectasis (Group A) (45.5% % vs. 6.5%; p< 0.001). (Table 1)

Group B patients had significantly higher cough score (5 vs. 3.05 ± 1.88; p< 0.001), higher frequency of colored sputum (72.7% vs. 18.8%; p< 0.001) and higher mMRC dyspnea score compared to Group A. Moreover, Group B patients had significant higher frequency of respiratory distress (72.7% vs. 14%; p< 0.001) and respiratory failure (90.9 % vs. 49.5%; p= 0.02) than Group A. (Table 2)
Serum ferritin was significantly higher among Group B than Group A (1312.01 ± 835.44 vs. 489.74 ± 222.34; p< 0.001). In contrast, oxygen saturation at admission was significantly lower Group B in comparison to those in Group A (70.54 ± 13.82 vs. 84.38 ± 14.10; p< 0.001). (Table 3)

Regarding the course of COVID-19 infection among both groups, the frequency of ICU’s admittance (25.3% vs. 72.7%; p< 0.001), necessity to non-invasive (72.7% % vs. 20.3%; p< 0.001), invasive mechanical ventilation (54.5% % vs. 12.8%; p= <0.001), duration of mechanical ventilator support, ICU’s stay and overall hospital stay were all statistically significant higher among Group B vs. Group A (p< 0.001). With respect to the outcome, death rate was significantly higher among Group B compared to Group A (14.8% vs. 54.5%; p< 0.001). (Table 4)

Figure 2 represents a HRCT of COVID-19 female patient 65 years old included in the study.

Discussion

This cross-sectional study included 411 patients with confirmed COVID-19 infection. Patients were subdivided into two groups according to the presence or absence of preexisting confirmed clinical and radiologic non-cystic fibrosis bronchiectasis, Group A; COVID-19 patients without bronchiectasis (97.3%), and Group B; bronchiectasis patients with COVID-19 (2.7%). The main findings of the study were that COPD was significantly more frequent in cases with bronchiectasis. At time of presentation cases with concomitant COVID-19 and bronchiectasis had higher cough score, more frequent sputum, worse mMRC, respiratory distress and respiratory failure. The course of COVID-19 infection in patients with concomitant bronchiectasis was worse with more frequent ICU
admittance, necessity for non-invasive and invasive ventilation, longer hospital and ICU stay and increased mortality.

As regards the clinical manifestations of concomitant COVID-19 and non-cystic fibrosis bronchiectasis:

The current study revealed that COPD was significantly more frequent in cases with bronchiectasis. At time of presentation cases with concomitant COVID-19 and bronchiectasis had higher cough score, more frequent sputum, worse mMRC, respiratory distress and respiratory failure.

A Chinese nationwide retrospective cohort study studied the prevalence of chronic respiratory illnesses among 39,420 laboratory-confirmed COVID-19 cases and their outcome from the electronic medical records, found that bronchiectasis was present in 27.9%. COPD-bronchiectasis overlap was the most common combination (50.7%), followed by COPD-asthma (36.2%) and asthma-bronchiectasis overlap (15.9%).(10) The Korean National Health Insurance Service (NHIS) provided researchers with a large national cohort for the evaluation of COVID-19, which comprised 8070 patients with a confirmed COVID-19. The rate of recorded bronchiectasis was 1.6% in the COVID-19 patients and 1.4% in the matched control (p=0.003) with a 1.22- fold increased odds ratio (95% confidence interval=1.01–1.45) of the prevalence of bronchiectasis in the COVID-19.(11) Another prospective study followed 30 patients from the Multidisciplinary Bronchiectasis Unit . They recorded 2 patients (6.6%) having concomitant COVID-19 during the follow-up period but they did not experience any acute bronchiectasis exacerbation as a result of COVID-19.(12) Lopinto et al., (13) described the first case of acute exacerbation of bronchiectasis, precipitated by COVID-19 infection and complicated by severe hemoptysis. In addition, Faqihi et al., (14) reported a case of co-infection of *Bordetella Bronchiseptica* and COVID-19 in a young patient with idiopathic bronchiectasis leading to severe disease
requiring mechanical ventilation. Moreover, in a postmortem study on 101 bodies researchers observed traction bronchiectasis in 53% of cases, the changes were bilateral and involving lower lobes but they could not confirm whether these changes were pre-existing or novel.(15)

In agreement to the finding of the current work, a large series of COVID-19 patients showed that cases with bronchiectasis were significantly older (p<0.001) and more frequently exhibited pulmonary comorbidities, including asthma (62.1% versus 30.4%) and COPD (57.6% versus 17.8%), than those without bronchiectasis. Additionally, patients with bronchiectasis also had more frequent extra-pulmonary comorbidities, including hypertension (52.3% versus 27.0%), diabetes mellitus (61.4% versus 31.0%), and heart failure (27.3% versus 10.1%), than those without bronchiectasis (p<0.001 for all). (11, 16)

Patients with preexisting chronic bronchiectasis had significantly higher cough score and frequency of colored sputum production in comparison to those without bronchiectasis in the current study which could be explained by the pathological nature of bronchiectasis as a suppurative disease characterized by chronic cough and sputum production due to impaired mucociliary clearance.(17)

Also, patients in the present study with preexisting chronic bronchiectasis had significantly higher frequency of respiratory failure and lower oxygen saturation at time of admission in comparison to those without bronchiectasis. Hypoxemia may be developed in those groups due to fibrotic changes which lead to traction bronchiectasis or due to chronic obstructive lung disease which affect lung function.(18)(19)

It was found that serum ferritin was significantly higher among those with concomitant chronic bronchiectasis in comparison to those without bronchiectasis. This result can be explained by the contribution of ferritin to the oxidative tissue
damage by producing free radicals. The ferritin level reflects presence and persistence of acute and chronic inflammatory processes that can cause structural damage of lung parenchyma. Based on this fact, an elevated ferritin level may be a reliable tissue inflammatory marker.(20)

The clinical outcome of patients with concomitant COVID-19 and non-cystic fibrosis bronchiectasis

The frequency of ICU’s admission, need to non-invasive and invasive mechanical ventilation, duration of mechanical ventilation, ICU’s stay and overall hospital stay were all statistically significantly higher among those with preexisting chronic bronchiectasis than those without bronchiectasis in the current study.

Choi and coworkers observed that COVID-19 patients with bronchiectasis suffered from more severe infection than those without bronchiectasis. In that study, COVID-19 patients with bronchiectasis exhibited a much higher rate of supplemental oxygen, ECMO, and higher mortality than those without bronchiectasis. Considering similar ICU admission rates, COVID-19 patients with bronchiectasis revealed worse clinical course than those without bronchiectasis although both groups had initial similar severity on admission to critical care. They suggested that the impairment in mucociliary function and the chronic inflammation in the airway of bronchiectatic patients is likely to increase their susceptibility to and severity of COVID-19 pneumonia.(11)

Regarding outcome, the current study revealed that death rate was significantly higher among those with preexisting chronic bronchiectasis than those without bronchiectasis. Similar data showing that COVID-19 patients with bronchiectasis showed more severe clinical manifestations and poorer outcomes than those without bronchiectasis were recorded by Choi and colleagues. (11)

The current study faced some limitations. First, the small number of recruited patients in a single city during a limited time frame resulted in a small
sample size of patients. Thus, the accuracy of comparative statistics could not be fully guaranteed. Second, the impact of different and widely used antimicrobial, anti-inflammatory and immunosuppressive drugs used to treat COVID-19 infection on course of bronchiectasis was not evaluated.

**In conclusion**, pre-existent bronchiectasis increases disease burden in COVID-19 patients. It is associated with increased disease severity, higher serum ferritin, worse clinical outcome (ICU admission, need for ventilator support) and mortality. It is recommended that patients with bronchiectasis should be advised to receive COVID-19 vaccines as well as other respiratory infection vaccines to avoid poor prognosis and death.

**List of abbreviations**

- COVID-19: Corona Virus Disease 2019
- ECMO: Extra-Corporeal Membrane Oxygenation
- GGO: Ground Glass Opacity
- HRCT: High Resolution Computed Tomography
- mMRC: Modified Medical Research Council
- SARS-CoV-2: Severe Acute Respiratory Syndrome Coronavirus-2

**Fund**

No financial support was required

**Conflict of interest**

Authors declared no conflict in the current work.

**Availability of Data and Materials**
The datasets analyzed during the current study are available upon request.

Authors' Contributions

AARMH; conception, design and revision. AMS; statistical analysis and medical writing. MKH; statistical analysis and medical writing. MAO; data collection and medical writing.

Acknowledgements

None.

References

Figure 1. Flowchart of the screened COVID-19 cases included in the study (n=425)

Table 1: Demographic characteristics of COVID-19 patients without and with preexisting chronic bronchiectasis included in the study:

<table>
<thead>
<tr>
<th></th>
<th>Group A (n= 400)</th>
<th>Group B (n= 11)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Age (years)</td>
<td>52.62 ± 17.80</td>
<td>52.64 ± 24.08</td>
<td>0.99</td>
</tr>
<tr>
<td>Gender</td>
<td></td>
<td></td>
<td>0.35</td>
</tr>
<tr>
<td>Male</td>
<td>257 (64.3%)</td>
<td>6 (54.5%)</td>
<td></td>
</tr>
<tr>
<td>Female</td>
<td>143 (35.8%)</td>
<td>5 (45.5%)</td>
<td></td>
</tr>
<tr>
<td>Active Smoking</td>
<td>323 (80.8%)</td>
<td>8 (72.7%)</td>
<td>0.36</td>
</tr>
<tr>
<td>Comorbidities</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>COPD</td>
<td>26 (6.5%)</td>
<td>5 (45.5%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Bronchial asthma</td>
<td>5 (1.3%)</td>
<td>0</td>
<td>0.87</td>
</tr>
<tr>
<td>Diabetes mellitus</td>
<td>76 (19%)</td>
<td>2 (18.2%)</td>
<td>0.65</td>
</tr>
</tbody>
</table>
Hypertension  106 (26.5%)  4 (36.4%)  0.33  
Hepatic disease  2 (0.5%)  0  0.94  
Renal disease  14 (3.5%)  0  0.68  
Cardiac diseases  29 (7.2%)  1 (9.1%)  0.57  
Other  28 (7%)  1 (9.1%)  0.55  

Data expressed as frequency (percentage), mean (SD). *P* value was significant if < 0.05. **COPD:** chronic obstructive pulmonary disease; **COVID-19:** coronavirus disease 2019. Age was compared by Mann Whitney test and all nominal data was compared by Chi² test.

**Table 2: Clinical characteristics of COVID-19 patients without and with preexisting chronic bronchiectasis included in the study:**

<table>
<thead>
<tr>
<th></th>
<th>Group A (n= 400)</th>
<th>Group B (n= 11)</th>
<th><em>P</em></th>
</tr>
</thead>
<tbody>
<tr>
<td>Cough</td>
<td>338 (84.5%)</td>
<td>11 (100%)</td>
<td>0.16</td>
</tr>
<tr>
<td>Cough score</td>
<td>3.05 ± 1.88</td>
<td>5</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Sputum</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>None</td>
<td>309 (77.3%)</td>
<td>2 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>Whitish</td>
<td>16 (4%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>Colored</td>
<td>75 (18.8%)</td>
<td>8 (72.7%)</td>
<td></td>
</tr>
<tr>
<td>Hemoptyis</td>
<td>0</td>
<td>1 (9.1%)</td>
<td></td>
</tr>
<tr>
<td>Dyspnea</td>
<td>294 (73.5%)</td>
<td>10 (90.9%)</td>
<td>0.17</td>
</tr>
<tr>
<td>mMRC score</td>
<td></td>
<td></td>
<td>0.12</td>
</tr>
<tr>
<td>0</td>
<td>137 (34.3%)</td>
<td>1 (9.1%)</td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>5 (1.3%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>53 (13.3%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>3</td>
<td>4 (1%)</td>
<td>0</td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>201 (50.2%)</td>
<td>10 (90.9%)</td>
<td></td>
</tr>
<tr>
<td>Fatigue</td>
<td>393 (98.3%)</td>
<td>11 (100%)</td>
<td>0.82</td>
</tr>
<tr>
<td>Sore throat</td>
<td>123 (30.8%)</td>
<td>2 (18.2%)</td>
<td>0.29</td>
</tr>
<tr>
<td>Cyanosis</td>
<td>199 (49.8%)</td>
<td>9 (81.8%)</td>
<td>0.03</td>
</tr>
<tr>
<td>Respiratory distress</td>
<td>56 (14%)</td>
<td>8 (72.7%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Respiratory failure</td>
<td>198 (49.5%)</td>
<td>10 (90.9%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

Data expressed as frequency (percentage), mean (SD). *P* value was significant if < 0.05. **mMRC:** modified medical research council; **COVID-19:** coronavirus disease 2019.
Cough score was compared by Mann Whitney test and all nominal data was compared by Chi² test.

**Table 3: Laboratory findings of COVID-19 patients without and with preexisting chronic bronchiectasis included in the study:**

<table>
<thead>
<tr>
<th></th>
<th>Group A (n= 400)</th>
<th>Group B (n= 11)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Leucocytes (10³/ul)</td>
<td>9.47 ± 4.01</td>
<td>11.39 ± 2.90</td>
<td>0.12</td>
</tr>
<tr>
<td>Lymphocytes (10³/ul)</td>
<td>1.18 ± 0.68</td>
<td>1.28 ± 0.61</td>
<td>0.61</td>
</tr>
<tr>
<td>CRP (mg/dl)</td>
<td>51.64 ± 34.45</td>
<td>77.74 ± 55.94</td>
<td>0.16</td>
</tr>
<tr>
<td>D-dimer (ng)</td>
<td>1.45 ± 1.22</td>
<td>2.04 ± 0.82</td>
<td>0.57</td>
</tr>
<tr>
<td>Serum ferritin</td>
<td>489.74 ± 222.34</td>
<td>1312.01 ± 835.44</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SO₂ at admission (%)</td>
<td>84.38 ± 14.10</td>
<td>70.54 ± 13.82</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>SO₂ at discharge (%)</td>
<td>88.78 ± 19.90</td>
<td>90.40 ± 3.78</td>
<td>0.86</td>
</tr>
</tbody>
</table>

Data expressed as frequency (percentage), mean (SD). P value was significant if < 0.05. **SO₂:** oxygen saturation; **COVID-19:** coronavirus disease 2019; **CORAD:** COVID-19 Reporting and Data System; **CRP:** C-reactive protein

All data was compared by Mann Whitney test and CORAD class was compared by Chi² test.

**Table 4: Clinical course and outcome of COVID-19 patients without and with preexisting chronic bronchiectasis included in the study:**

<table>
<thead>
<tr>
<th></th>
<th>Group A (n= 400)</th>
<th>Group B (n=11)</th>
<th>P</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site of care</td>
<td></td>
<td></td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Home isolation in Ward</td>
<td>195 (48.8%)</td>
<td>1 (9.1%)</td>
<td></td>
</tr>
<tr>
<td>ICU admission</td>
<td>104 (26%)</td>
<td>2 (18.2%)</td>
<td></td>
</tr>
<tr>
<td>Hospital stay (day)</td>
<td>4.33 ± 2.15</td>
<td>12.36 ± 10.77</td>
<td>0.02</td>
</tr>
<tr>
<td>ICU’s stay (day)</td>
<td>1.79 ± 1.32</td>
<td>7.55 ± 7.15</td>
<td>0.03</td>
</tr>
<tr>
<td>Ventilatory support</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>-----------------------------</td>
<td>----------------</td>
<td>----------------</td>
<td>--------</td>
</tr>
<tr>
<td>NRM</td>
<td>73 (18.3%)</td>
<td>2 (18.2%)</td>
<td>0.67</td>
</tr>
<tr>
<td>Vapotherm</td>
<td>25 (6.3%)</td>
<td>0 (0.0%)</td>
<td>0.49</td>
</tr>
<tr>
<td>Non-invasive ventilation</td>
<td>81 (20.3%)</td>
<td>8 (72.7%)</td>
<td>0.001</td>
</tr>
<tr>
<td>Mechanical ventilation</td>
<td>51 (12.8%)</td>
<td>6 (54.5%)</td>
<td>&lt; 0.001</td>
</tr>
</tbody>
</table>

| Duration of MV (day)        | 3.57 ± 1.23    | 7.34 ± 6.91    | < 0.001|

<table>
<thead>
<tr>
<th>Outcome</th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Alive</td>
<td>341 (85.3%)</td>
<td>5 (45.5%)</td>
<td>&lt; 0.001</td>
</tr>
<tr>
<td>Death</td>
<td>59 (14.8%)</td>
<td>6 (54.5%)</td>
<td></td>
</tr>
</tbody>
</table>

Data expressed as frequency (percentage), mean (SD). *P* value was significant if < 0.05. **ICU:** intensive care unit; **NRM:** non-rebreathing mask; **MV:** mechanical ventilation; **COVID-19:** coronavirus disease 2019

Continuous data was compared Mann Whitney test and all nominal data was compared by Chi² test.
Figure 2. Female patient 65 years old diagnosed as COVID-19 with pre-existing bronchiectasis. HRCT was graded as CORAD IV she needed ICU admission and mechanically ventilated with a total of 16 days hospital stay.