

# A Case Report on Pulmonary Rehabilitation for Post COVID-19 Patient with Pulmonary Fibrosis

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## Abstract

Pulmonary fibrosis is an adjacent sequel of COVID-19 leading to long-lasting respiratory complications and activity limitations of pulmonary function. A small proportion of post-COVID-19 cases with severe complaints of the development of lung fibrosis. The elderly, especially those who are challenged with Intensive Care Unit (ICU) and mechanical ventilation are the top-most threat for developing such lung fibrosis. Pulmonary rehabilitation is favorable for minimizing the symptoms following a structured pulmonary rehabilitation program designed by specialized professionals. Here, presents a case of successful pulmonary rehabilitation of a patient with post-COVID-19 pulmonary fibrosis following the supplementary pulmonary rehabilitation exercise protocol under the department of physiotherapy and rehabilitation. Respiratory physiotherapy is the gold standard for maintaining cardiorespiratory fitness and overall, quality of life. This case suggested the consequence of pulmonary rehabilitation programs for post-COVID-19 pulmonary fibrosis survivors.

**Keywords:** Coronavirus disease 2019 • Pulmonary fibrosis • Pulmonary rehabilitation

## Introduction

Pulmonary fibrosis is the lung compliance characterized by a dry cough, weariness, dyspnea and in extreme cases the requirement for oxygen supplementation [1]. For patients with pulmonary fibrosis, lung auscultation may be normal or patchy with diffuse crackles [2].

The likelihood of spontaneous remission and the requirement for medication therapy of chronic fibrotic lung damage in post-COVID patients are currently being debated. Studies on a variety of respiratory illnesses, including influenza and atypical pneumonia show a strong correlation between viral damage to lung tissues, abnormal inflammatory response, the establishment of persistent lesions and the development of fibrosis [3].

It's also possible that the prolonged inflammatory response damages the vascular endothelium and epithelium of the respiratory tract, leading to tissue damage caused by cytokines. As a result, the restoration of normal breathing and lung tissue regeneration may be hampered [4]. TGF-1 and other growth factors (FGF, EGF) are up-regulated followed by activation of pro-fibrotic pathways and an imbalance in the rennin-angiotensin system, all of which may contribute to the development of post-COVID lung fibrosis [5].

Pulmonary fibrosis is a medical disorder in which the lungs scar and breathing becomes more difficult as a result of different

respiratory complications [6]. For the treatment of post-inflammatory COVID-19 lung fibrosis, there is currently no fully established rehabilitation strategy available. But the rehabilitation is important at the acute and especially recovery stage. It helps with breathing, exercise endurance, self-care in daily activities and psychological support. So, the aim of this study is to evaluate the effect of Pulmonary Rehabilitation on a single case of post-COVID-19 pulmonary fibrosis.

## Case Presentation

Mr. X, a 70-year-old smoker male businessman lived in a village with his family members. He was admitted to Z.H Sikder's Medical College and Hospital with symptomatic COVID-19 for 5 days. The diagnosis was based on a nasopharyngeal swab using the Reverse Transcription Polymerase Chain Reaction (RT-PCR) test for SARS-CoV-2 RNA and chest computed tomography (CT scan) (Figure 1). Two days after admission, that is, 7 days after symptom onset, his dyspnea worsened and he required endotracheal intubation. He was subsequently placed on mechanical ventilation for 10 days and supervised physiotherapy care. On the 15<sup>th</sup> hospital day his nasopharyngeal swab PCR test result turned negative and he was transferred from the intensive care unit to the general ward. The antibiotics and corticosteroids were stopped as the general condition

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improved. However, he required oxygen supplementation via nasal cannula with a flow of 22 L per minute of oxygen. The CT scan was advised by pulmonologist and diagnosed the patient with pulmonary fibrosis as subsequent complication of COVID-19 and advised him to continue the rehabilitation treatment. At the start point of rehabilitation clinician reassess on the basis of rehabilitation and functional status through developed assessment form and valid questionnaire (Figures 1 and 2, Tables 1-4).

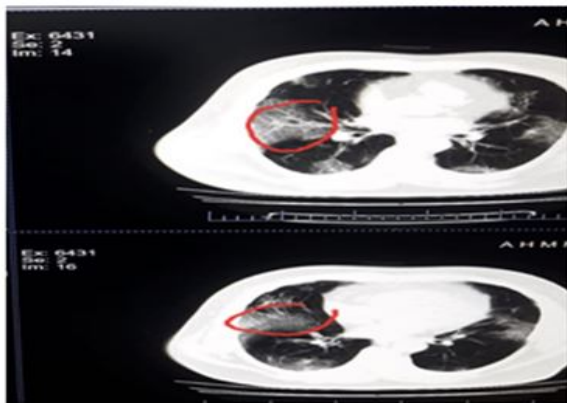


Figure 1. CT scans.



Figure 2. Rehabilitation treatment.

Data	Initial	7 <sup>th</sup> day	15 <sup>th</sup> day	25 <sup>th</sup> day	Discharge
Blood Pressure (mmHg)	130/90	130/80	130/90	130/85	130/85
Respiratory Rate (per minute)	28	25	18	16	18
Pulse Rate	42	76	80	80	78
O <sub>2</sub> Saturation%	84	93	94	93	93
O <sub>2</sub> Therapy L/min	22	2	--	--	--

Table 1. Checklist and progress report.

Problem	Do you have the problem?		Do you receive treatment for it?		Does it limit your activities?	
	No	Yes	No	Yes	No	Yes
Heart diseases		✓		✓		✓
High Blood Pressure		✓		✓		✓
Respiratory Disease		✓		✓		✓
Diabetes		✓		✓		✓
Ulcer and stomach disease		✓				
Depression						
Osteoarthritis, degenerative arthritis		✓		✓✓		✓
Back pain		✓		✓		✓

Table 2. Katz-self-administered co-morbidity Questionnaire.

Modified borg dyspnea scale	Initial	7 <sup>th</sup> day	15 <sup>th</sup> day	25 <sup>th</sup> day	Discharge
0-1-2-3-4-5-6-7-8-9-10 Nothing at all Maximal	7	5	3	3	2

**Table 3.** Assessment of the symptoms of breathlessness.

Respiratory functions by spirometry					
	Initial	7 <sup>th</sup> day	15 <sup>th</sup> day	25 <sup>th</sup> day	Discharge
FVC (% predicted)	51%	55%	68%	70%	72%
FEV1 (% predicted)	62%	69%	72%	75%	80%
FEV1/FVC	89	87	84	84	82
PCF (L/min)	360	580	640	660	680
MIP (cm H <sub>2</sub> O)	65	67	77	79	83
MEP (cm H <sub>2</sub> O)	73	75	79	85	110
Functional abilities					
Hand grip strength (right/left) kg	33/28	33/29	34/32	35/33	37/33
SPPB (total 12)	7	9	11	11	12
6 MWD (M)	290	310	380	410	490
TGUG (Second)	12	11	8	7	7

**Note:** 6 MWD=6-Minute Walking Distance, FEV1=Forced Expiratory Volume in 1 second, FVC=Functional Vital Capacity, MEP=Maximal Expiratory Pressure, MIP=Maximal Inspiratory Pressure, PCF=Peak Cough Flow, SPPB=Short Physical Performance Battery, TGUG=Timed Get Up And Go Test.

**Table 4.** Functional assessment and progress report.

**Disability assessment:** An interviewer administered questionnaire using the World Health Organization Disability Assessment Schedule 2.0 (WHODAS 2.0) (Table 5 and Figure 3).

I am now going to ask you about difficulties in taking care of yourself.

The answer and the scoring are as follows:

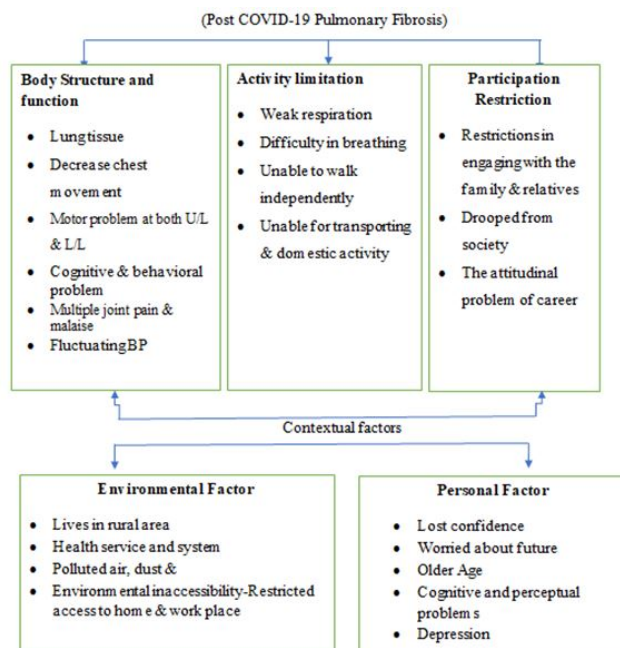
None=1, Mild=2, Moderate=3, severe=4, Extreme or cannot do=5

**Domain 1:** Cognition.

Domain	In the past 30 days, how much difficulty did you have in:	Initial	discharge
D-1	Cognition (There are 6 subdomains with maximum 5 points that counts for total 30)	22/30	6/30
D-2	Mobility (There are 5 subdomains with maximum 5 points that counts for total 25)	23/25	12/25
D-3	Self-care (There are 4 subdomains with maximum 5 points that counts for total 20)	18/20	6/20
D-4	Getting along (There are 5 subdomains with maximum 5 points that counts for total 25)	14/25	6/25
D-5	Life activities (There are 8 subdomains with maximum 5 points that counts for total 40)	38/40	22/40
D-6	Participation (There are 6 subdomains with maximum 5 points that counts for total 30)	27/30	6/30

**Table 5.** Disability assessment (WHODAS 2.0).

### International classification of functioning, disability and health health condition



**Figure 3.** The International Classification of Functioning (ICF), disability and health described for persons with pulmonary fibrosis.

**Intervention:** The clinician decided to provide a conventional pulmonary rehabilitation program for post COVID-19 pulmonary fibrosis according to “evidence-based consensus statement on the role of physiotherapy in pulmonary rehabilitation in the indian context” [7].

The program consisted of 10 supervised physical therapy sessions according to frequency, intensity, time, and type principles: 5 days a week of frequency, 09 to 14 on borg Rating of Perceived Exertion (RPE) of intensity, 60 minutes per day of time, stretching, strengthening and aerobic exercises of type (Table 6).

Exercise Type	Frequency	Intensity	Time	Reference
Stretching and warm-up	5 days/week	10 repetitions with 5 sets		Liu, Zhang, Yang, Zhang, Li and Chen, (2020).
Strengthening	3/week	12 to 14 of Borg RPE	5 minutes	Choi, Kim, Lee, and Kim,(2021)
Aerobic exercises	5 days/week	12 to 14 of Borg RPE	30 minutes	Liu, Zhang, Yang, Zhang, Chen, (2020)
Cool down	5 days/week	12 to 14 of Borg RPE	10 minutes	Choi, Kim, Lee, and Kim,(2021).
Pursed-lips breathing exercise	3 times/day-4 times/day	10-15 repetitions, 3 sets	5 minutes-10 minutes.	Swigris, Brown, Make, Wamboldt, (2008)
Abdominal / breathing exercise	3 times/day-4 times/day	10-15 repetitions,3 sets	5 minutes-10 minutes	Liu, Zhang, Yang, Zhang, Li and Chen, (2020).
Relaxed slow and deep breathing exercise	3 times/day-4 times/day	10-15 repetition, 3 sets	5 minutes-10 minutes	Swigris, Brown, Make, Wamboldt, (2008)

**Table 6.** Pulmonary rehabilitation exercise protocol.

\*For upper extremity strengthening, dumbbells were used. For lower extremity strengthening, Noland and Kuckhoff table with weights. SpO<sub>2</sub> was detected via pulse oximeter.

## Discussion

Many pharmacological treatments have been challenged for post-acute COVID-19 pulmonary fibrosis with confined evidence. Several

narrative critiques are counseled on pulmonary rehabilitation program primarily based at the management guidelines of chronic obstructive pulmonary disease or different chronic pulmonary [8]. Thus, rehabilitation is gaining more importance. So far, no guidelines or systematic reviews of pulmonary rehabilitation for post COVID-19 pulmonary fibrosis. The authors found some case study but didn't offer the details information of the rehabilitation program. In this case, we provided a preferred and structured exercising program with monitoring followed by “evidence-based consensus statement on the role of physiotherapy in pulmonary rehabilitation in the indian

context". In general, pulmonary rehabilitation for lung fibrosis decreases dyspnea and improves exercising ability and quality of life [9,10].

In addition to active drug treatment, it is equally important to minimize the respiratory symptoms and associated complications to improve the quality of life of patients and such patients should actively carry out rehabilitation interventions to reduce morbidity and mortality. To the point of explicit and tacit knowledge this is the report of a successful attempt at the rehabilitation of post COVID-19 Pulmonary fibrosis. The steady but progressive response of the patient to treatment was novel in the authors opinion. The unique presentation makes this case noteworthy with respect to detailed timing of the events.

As the patient, initially present with depressed level of cognition and additional symptoms onset of dyspnea, chest tightness, respiratory distress, and fatigue, and impaired mobility, difficulty with coordinated and balanced posture. He was treated under the supervision of a physiotherapist with an exercise program with stretching, strengthening, breathing and aerobic exercise with cardio-respiratory care according to FITT and the intensity measured by Borg Rating of Perceived Exertion (RPE). Physiologically, breathing exercises lift the abdomen and chest cavity and cause an increase in intra-thoracal pressure. Deep and long inspiration will induce surfactant secretion produced by alveolar type II and increase chest expansion 10. Following the initial path-gnomonic symptoms described, he gradually displayed improvement and ultimately making a remarkable symptomatic and functional recovery by one and half months with rehabilitation management.

From the point of patient and his career, he is now much better than previous. Now he is happy to share his feeling to walk independently and performing Activity of Daily Living (ADL) without minimal support or supervision. According to the patient's career opinion they are very much thankful to the clinician who were involve in the management of such critical case with care and professionalism. Author could conclude that the report had a favorable outcome following the management of post COVID-19 pulmonary fibrosis through gradual physiotherapy treatment.

## Conclusion

This case reported post COVID-19 pulmonary fibrosis with severity of symptoms and the evidence encouraged the medical management as well as early care of physical therapy and the optimal nutritious support. The incremental advancements in the mental and the functional capacity may take months to be noticed from the various evidence and from the case. Chest therapy, breathing exercise, aerobic exercise and specific rehabilitation for patients with post COVID-19 pulmonary fibrosis may improve the dyspnoea, chest discomfort, fatigue, poor transitional mobility, uncoordinated movement and gross motor function of patients and significantly restore activities of daily living. The expert practioner explosively

suggested that early care and physiotherapy treatment with proper medication are the possible standard for the management and improvement of such respiratory disorder. Future studies in the form of well-designed, randomized clinical trials should be performed to evaluate the effectiveness of physiotherapy and rehabilitation management for patients withpost COVID-19 pulmonary fibrosis. This is critical information for rehabilitation practitioner that has been determined to be successful in patients with post COVID-19 pulmonary fibrosis.

## Reference

1. Lechowicz, Kacper, Drozdal S, Machaj F and Rosik J, et al. "COVID-19: The Potential Treatment of Pulmonary Fibrosis Associated with SARS-CoV-2 Infection." *J Clin Med* 9 (2020): 1917.
2. Picchi, Giovanna, Mari A, Ricciardi A and Carucci AC, et al. "Three cases of COVID-19 Pneumonia in Female Patients in Italy Who Had Pulmonary Fibrosis on Follow-Up Lung Computed Tomography Imaging." *Am J Case Rep* 21 (2020): 926921.
3. Udawadia, Zarir F, Koul PA and Richeldi L. "Post-COVID Lung Fibrosis: The Tsunami That Will Follow The Earthquake." *Lung India* 38 (2021): 41.
4. Chun, Hyung J, Coutavas E, Pine AB and Lee AI, et al. "Immunofibrotic Drivers of Impaired Lung Function In Post-Acute Sequelae of Sars-Cov-2 Infection." *JCI Insight* 6 (2021): 148476.
5. McDonald, Lindsay T. "Healing After Covid-19: are Survivors At Risk for Pulmonary Fibrosis?." *Am J Physiol Lung Cell Mol Physiol* 320 (2021): 257-265.
6. Rai, Deependra Kumar, Sharma P and Kumar R. "Post COVID 19 Pulmonary Fibrosis. Is It Real Threat?" *Indian J Tuberc* 68 (2021): 330-333.
7. Swaminathan, Narasimman, Jiandani M, Surendran PJ and Jacob P, et al. "Beyond COVID-19: Evidence-based Consensus Statement on The Role of Physiotherapy in Pulmonary Rehabilitation in the Indian Context." *J Assoc Physicians India* 68 (2020): 82-89.
8. Yan, Huan, Ouyang Y, Wang L and Luo X, et al. "Effect of Respiratory Rehabilitation Training on Elderly Patients with COVID-19: a Protocol for Systematic Review and Meta-Analysis." *Medicine* 99 (2020): 22109.
9. Lee, Annemarie L, Hill CJ, McDonald CF and Holland AE. "Pulmonary Rehabilitation In Individuals with Non-Cystic Fibrosis Bronchiectasis: A Systematic Review. " *Arch Phys Med Rehabil* 98 (2017): 774-782.
10. Vitacca, Michele, Carone M, Clini EM and Paneroni M, et al. "Joint Statement on The Role of Respiratory Rehabilitation in The COVID-19 Crisis: The Italian Position Paper." *Respiration* 99 (2020): 493-499.

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