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Case Series

Functional status of COVID-19 patients at discharge from acute care

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ABSTRACT

Coronavirus disease 2019 (COVID-19) is a multisystem illness that can affect a person's mental and physical health exhibiting various physiological and behavioural symptoms. The long-term consequence of COVID -19 affects the quality of life of these patients. The quality of life depends on the status of the physical function. Hence the need to focus on post-COVID rehabilitation in addition to already existing acute care Physiotherapy. This case series, describes functional status of 5 patients at the time of discharge from the Tertiary Care Hospital. The evaluation is done on the day of discharge of each patient using six outcomes, namely Breath Holding Time, 1 Minute Sit to Stand Test, 6 Minute Walk test, Heel Raise Test, 4 Meter Gait Speed Test and muscle strength, to study the functional status. All the patients showed impairment in musculoskeletal capacity (one MSTS, manual muscle test, Heel raise test), functional capacity (6 MWT), lung capacity (BHT) and gait speed as compared to their normal values.This case series brings out the reduced functional status of COVID-19 patients in all domains of fitness at discharge. Thus, there is a dire need for Physiotherapy based holistic pulmonary rehabilitation even after discharge to prevent or delay the possible late manifestation of the disease.

Keywords: Functional status, COVID-19, 6MWT, STS

INTRODUCTION

The World Health Organization (WHO) declared the outbreak of the novel Coronavirus to be a Public Health Emergency of International Concern on the 30th of January 2020. The virus is primarily known to affect the respiratory system and other organ systems are eventually involved. The disease course and symptomatology are extremely variable, ranging from mild symptoms to ARDS with severe hypoxemia.[1] A systematic review by Abdullahi et al related to SARS infection have indicated a substantial increase in musculoskeletal and neurological burden in addition to cardiorespiratory involvement.[2] Physiotherapy is being routinely provided in the acute care settings as a standard of care, however, there is less evidence of post discharge referral for Physiotherapy as a standard care.[3] To date, less data is available on the physical functioning at discharge from hospital. Performing normal ADLs efficiently is directly related to physical functioning and determines Quality of Life.

This case series presents five cases who received standard medical care and physiotherapy in our COVID dedicated tertiary care hospital. The evaluation is done on the day of discharge of each patient using six outcomes, namely Breath Holding Time, 1 Minute Sit to Stand Test, 6 Minute Walk test, Heel Raise Test, 4 Meter Gait Speed Test and muscle strength, to study the functional status and evaluate the need for post discharge rehabilitation.

CASE SERIES

Patient details

All patients tested COVID-19 positive with RT-PCR test at admission.

Table 1: Patient details.

Case No.	Sex	Age (years)	Hospital stays (number of days)	Comorbidities	Lung Involvement (%)
1	F	41	15	Hypertension	50-60
2	F	55	16	Hypertension and Diabetes	50-60
3	M	67	17		50-75
4	M	53	26		60-70
5	M	55	50		70

HRCT for all patients revealed bilateral ground glass opacities, septa thickening, fibrosis, reticulations, traction bronchiectasis and crazy paving patterns in bilateral lung fields with varying severity as described in Table 1.

Case 1

41 year old female, an office worker by profession, a known hypertensive, with a positive travel and contact history presented with the complains of chills, intermittent fever, and increased breathlessness present since 4 days preceding the hospital admission. During the time of admission, her pulse rate was 118 beats per minute and SpO2 was 88% on room air and she tested COVID positive on RT-PCR test. The patient was started on 8 l/min moist O2 via a face mask and maintained saturation at 98%. HRCT done on 12th day of admission revealed bilateral ground glass opacities, reticulations, traction bronchiectasis with 50-60% lung involvement suggesting atypical pneumonia. The patient was started on physiotherapy treatment the day after admission. The patient gradually progressed and was tapered of oxygen therapy from face mask to nasal cannula and then to room air on the 10th day post admission. RT-PCR done on 12th day tested negative and she was discharged on 15th day.

Table 2: 1 Minute sit to stand repetitions.

Case No.	1 MSTS repetitions {Normal: The median number of repetitions ranged from 50/min (25–75th percentile 41–57/min) in men and 47/min (39–55/min) in women}[4]
1	16
2	14
3	12
4	15
5	187890

Case 2

55 year old female, a housewife with known comorbidities of hypertension and diabetes was admitted 10 days post onset of symptoms of nausea, vomiting, intermittent fever and chills which relieved on medications. She showed sudden worsening of symptoms on 10th day with severe shortness of breath, and body ache. During the time of admission, her pulse rate was 108 beats per minute and SpO2 86% on room air and tested COVID positive on RT-PCR test.

Table 3: Percentage of predicted distance.

Case No.	Distance walked in Meters	% predicted 6 MWD (ATS)
1	240	34.12
2	280	54.96
3	200	42.02
4	240	44.11
5	274	49.99

She was immediately started on oxygen therapy with 8 l/min moist O2 via the non-rebreathing mask and bag ventilation. HRCT done on 5th day post admission revealed bilateral ground glass opacities, septal thickening and fibrosis, reticulations with crazy craving patterns suggestive of atypical pneumonitis. Patient was started on physiotherapy on the 3rd day of admission. Patient showed gradual improvement in course of 10 days and was tapered off on oxygen from NRBM to face mask to nasal cannula. Patient was on room air on 11th day with saturation maintained at 95%. Repeat RT-PCR done on 14th day tested negative and the patient was discharged on 16th day.

Case 3

67 year old male, retired personnel, diagnosed with co-morbidities of hypertension and diabetes was admitted with the complaints of breathlessness, cough, abdominal pain and sore throat persistent since 5 days. At the time of admission, his Pulse Rate was 100 beats per minute and SpO2 was 80% on room air, and he tested COVID positive on the RT-PCR test. The patient was immediately started on 12 l/min moist O2 via a non-rebreathing mask and bag ventilation and maintained saturation at 99%. HRCT done on the 5th day post admission revealed ground glass opacities with interlobular septal thickening in bilateral lung fields, predominantly in the sub pleural location. The area of lung involvement was 50-75% suggestive of atypical pneumonia. The patient was started on Physiotherapy treatment 10 days post admission. The patient gradually showed progress in the demand of external oxygen

support moving to ventilation via face mask, nasal cannula and finally to room air 13 days post admission. RT-PCR done 17 days after admission was negative for SARS-CoV-2 and the patient was discharged.

Case 4

53 year old male, worker in a company, with comorbidities of hypertension and diabetes was admitted with the complains of increased breathlessness, cough, fever, and body ache since 3 days. He was admitted on 4th day since the onset of symptoms with pulse rate of 126 beats per minute, and SpO2 of 89% on room air and was positive test on RT-PCR. The patient was then immediately started with oxygen therapy on 8 l/min moist O2 via face mask and maintained saturation at 98%. HRCT was done on 7th day post admission which revealed multifocal areas of ground glass opacities, reticulations, interlobular septal thickening, fibrosis with traction bronchiectasis, predominantly on the left side (60-70% of lung involvement). Right diaphragmatic palsy with atypical pneumonia was noted. The patient was started on physiotherapy treatment 7 days post admission. The patient gradually showed progress in demand of external oxygen support moving to ventilation from face mask to nasal cannula and finally to room air 22 days post admission. RT-PCR done 24 days after admission was negative and the patient was discharged 2 days later.

Table 4: Breath holding time.

Case No.	Breath Holding Time (seconds) (Normal 45-55 seconds) [6]
1	20
2	23
3	12
4	15
5	9

Case 5

55 year old male, a cab driver with profession, with known co-morbidities of hypertension and diabetes was admitted with the complaints of dry cough, generalised weakness and intermittent fever persistent since 5 days. During the time of admission, his Pulse Rate was 125 beats with minute and SpO2 was 92% on room air and tested COVID positive on the RT-PCR test. The patient was started on 10 l/min moist O2 via a face mask and maintained saturation at 97%. HRCT done on the 15th day of admission revealed bilateral ground glass opacities, reticulation with traction bronchiectasis, crazy paving pattern in both lung fields with 70% of lung involvement suggesting late stage atypical pneumonitis (CORADS VI). Pneumomediastinum and mild cardiomegaly were also noted. The patient was started on Physiotherapy therapy treatment the following day after admission. The patient was unable to maintain saturation without external oxygen support and was gradually weaned off to maintain saturation at room air 34 days after admission. RT-PCR done on the 44th day post admission was negative and the patient was discharged after a hospital stay of 50 days.

Table 5: Heel raise test.

Case No.	Heel Raise repetitions[7]	
	Left (Normal 23 repetitions)	**Right (Normal 24 repetitions)**
1	15	18
2	12	15
3	3	2
4	10	11
5	9	10

Table 6: 4 meter gait test.

Case No.	4meter gait test (seconds)	Speed (m/s) (Normal gait speed: 1.31-1.43 m/s) [8]
1	20	0.2
2	15	0.267
3	7	0.571
4	16	0.25
5	4	1

DISCUSSION

As can be seen from Table 1-5, all the patients showed impairment in musculoskeletal capacity (One MSTS, manual muscle test, Heel raise test), functional capacity (6 MWT), lung capacity (BHT) and gait speed as compared to their normal values. In the present study age predicted distance was in the range of 200-300 m and the performance amounted to 35 to 55% of their age predicted value. Lower breath holding time values have been recorded in COVID-19 patients which was also found to be true in the five patients assessed. Reduced planter flexor function found in our patients is an indicator of reduced physical capacity which could be attributed to fatigue and muscle weakness. All of the five patients assessed recorded reduced gait speed when compared to age and gender matched individuals.

A reduction in functional capacity and physical performance can be explained on the basis of multisystem involvement in COVID-19 affection. Dissed et.al stated that when compared to age matched healthy controls approximately 2-3 months after discharge from hospitals, patients with moderate and severe SARS had a 32% reduction in grip strength and 13% reduction in distance walked over 6 minutes.[9] This suggests that SARS infection leads to deficit in both muscle strength and endurance likely due to the pro-inflammatory effect and

deconditioning that occurs during the acute and convalescent period as well.

As the influx of Covid-19 patients was increasing rapidly, patients were discharged home after a negative RT-PCR test not necessarily withstanding the physical status of the patient. Physiotherapy is being routinely provided in the acute care settings as a standard of care, however, there is less evidence of post discharge referral for Physiotherapy as a standard care.[10-11] Skeletal muscle fibers have an abundant expression of ACE2 receptors on them. COVID mediated inflammatory processes may lead to skeletal muscle pain, weakness and injuries. Dysfunction of the Renin-Angiotensin system which is the modulator of muscle mass also contributes towards the reduction in muscle strength and function. Immobilization due to hospitalization, dyspnoea, ageing and malnutrition are amongst the major contributing factors leading to reduced muscle strength in these individuals which in turn hinder the physical functioning, increases frailty and reduce quality of life.12 During previous outbreaks of the virus (SARS and MERS), the affected individuals reported persistent issues for more than over a year after the primary episode with evidence showing reduced pulmonary functioning, compromised functional capacity, emotional distress and reduced Quality of Life over a prolonged period of time.[13] A reduction in the lung function as seen by low BHT can be attributed to the pathological changes seen as ground glass opacities on CT scan on admission but still persist during recovering period.

Thus, the involvement of multiple system could lead to a new pandemic of critical illness survivors and hence it is empirical to expand rehabilitation services in a developing country like India. It is encouraging to know that reduced muscle strength and peripheral deconditioning, fatigue, exertional desaturation and reduced exercise capacity are reversible with an appropriate tailor-made rehabilitation program and indicated the need of rehabilitation services in a developing country like India.

CONCLUSION

This case series brings out the reduced functional status of COVID-19 patients in all domains of fitness at discharge. Thus, there is a dire need for Physiotherapy based holistic pulmonary rehabilitation even after discharge to prevent or delay the possible late manifestation of the disease.

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