

A Retrospective Cohort Study of Effects of Physiotherapy in Rehabilitation in Post Covid-19 Patients

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ABSTRACT

Background: The coronavirus pandemic elucidated how a single highly infectious virus can overburden the health care system of highly developed nations. Elderly people and those with an underlying health condition are considered to be more at risk of developing severe symptoms and have a higher risk of physical deconditioning during their hospital stay & post-COVID-19.

Objective: To describe the importance and assess the effects of Physiotherapy in rehabilitation in Post Covid-19 Patients in full recovery

Method: This retrospective cohort study was determined to witness the evidence of the primary outcome of quantifying Dyspnea (through the Dyspnea grading scale), SpO₂ levels, and oxygen requirement of the patient. The secondary outcome included assessment and evaluation of functional activity using various scales such as the Functional mobility scale (FMS), Functional Independence Measure (FIM), and Rating of Perceived Exertion (RPE) at the time of admission and the end of the rehabilitation program.

Results: Using the mentioned scales, data on each patient, O₂ support, mobility status, and independence regarding ADLs have all improved gradually over the study period, as evidenced by the outcomes that were revealed by our statistical analysis. By the completion of the rehabilitation program, precisely 92.30% of patients were on room air, 73.33% gained no Dyspnea, 86.67% achieved full activity, 53.33% gained complete

independence of ADLs, and 40.00% gained no exertion with physical activity.

Conclusion: The study revealed concrete proof of the efficacy of the physiotherapy recommendations accompanied by the significant results derived through the above variable study scores. Additional research is required, to support these preliminary findings.

Keywords: Physiotherapy, Rehabilitation, COVID-19, Respiratory support.

INTRODUCTION

The coronavirus pandemic elucidated how a single highly infectious virus can overburden the health care system of highly developed nations. The spread of COVID-19 occurs mainly through respiratory droplets and aerosol produced when an infected person coughs/sneezes [1]. Patients with varying degrees of sickness appear to have different transmission and duration patterns [2]. Poor health is associated with a higher risk of respiratory complications from the virus. COVID-19 survivors run the risk of developing long-term side effects including lethargy, Dyspnea, and functional impairments. Patients with varying degrees of illness appear to have distinct intervals and rates of transmissibility [2]. Symptoms of covid-19 such as Fever are present in 83-99% of patients, Cough in 59-82%, Fatigue in 44-70%, Weight loss in 40-84%, shortness of

breath in 31-40%, secretions in 28-33% and Myalgia in about 11-35% of patients summarized in the table below.

Symptoms of Covid-19	Percentages
Fever	83-99%
Cough	59-82%
Fatigue	44-70%
Weight loss	40-84%
Shortness of breath	31-40%
Secretions	28-33%
Myalgia	11-35%

Our understanding of COVID-19 has consistently expanded as a result of the accumulating experience of treating COVID-19 patients, particularly serious and critical, in clinical practice. 32% of COVID-19 patients continued to have reduced physical performance 3–6 months after discharge, according to Baricich et al., cross-sectional study [15]. These results illustrate the significance of rehabilitation, even after patients. In recent studies, an international group of authors described physiotherapy Rehabilitation management post-COVID-19, in an acute hospital setting. The purpose of physiotherapy in the rehabilitation of COVID-19 patients has been specified in several publications and guidelines. Present guidelines should be updated in light of the numerous clinical investigations that have previously been executed and published [14]. Physiotherapy exercises for patients with post-COVID-19 comprise elements of respiratory support and active mobilization. Respiratory support includes breathing control, thoracic expansion exercises, respiratory muscle strengthening, and active mobilization. It is important to standardize techniques and procedures for respiratory rehabilitation in diverse regions due to the range of respiratory, physical, and psychological dysfunction in patients [14]. Rehabilitation should focus on both promoting human goods and reducing or avoiding risks. Physiotherapy plays an important role in treatment. Change in posture, functional mobility status, and ADLs. Elderly people and those with an underlying health condition are considered to be more at risk of developing severe

symptoms [3] and have a higher risk of physical deconditioning during their hospital stay [4]. The guidelines are influenced by the prevailing rehabilitation in the region. However, there is very little actual research on the impact of rehabilitation after COVID19 with only one randomized controlled trial published to date [8].

It's crucial to determine how much a condition of the patient affects their functioning and HRQoL and to put the right interventions to support rehabilitation [13]. So, we characterized the pulmonary function, and disability status, and proposed an early rehabilitation protocol in a cohort of post-COVID-19 patients admitted at Apokos rehabilitation hospital, Hyderabad, Telangana. Therefore, this study aims to describe the significance and assess the effects of Physiotherapy in rehabilitation in Post Covid-19 Patients in full recovery.

LITERATURE REVIEW

The literature search required for this research was carried out using a few keywords - Effects of physiotherapy rehabilitation, post-covid-19 respiratory distress on PubMed and Google Scholar. All Prospective studies, retrospective studies, and review articles in alignment with our study have been acknowledged and taken into evidence for literature work.

MATERIALS & METHODS

This study was carried out at Apokos Rehabilitation Hospital, Hyderabad for a study period of 14 days. This is a retrospective observational cohort study. An Institutional Review Board's approval was taken for the study. During the Research period, the post-COVID-19 patients within the age group of 50-80 years data, visiting Physiotherapy Rehabilitation were considered for the study. A structured patient demographic form has been used to collect the details such as age, weight, BMI, etc. Past medical and medication history, social history, personal history, complications, lab investigations, etc

The total sample collected for the study was 35. The Inclusion Criteria include all patients after 2 weeks of COVID diagnosis & Exclusion criteria include patients with tracheostomy and central lines, and cardiomyopathy (pre-existing) with EF-38-40%. The subjects selected were in-patients on examination of shortness of breath and difficulty performing functional activities and other prevailing symptoms, along with the laboratory data, and the diagnosis was confirmed. A total of 30 patients are enrolled in the study.

Categorical variables (age, gender, co-morbidities) are presented as frequencies (percentage) and continuous data as mean (\pm standard deviation) or median (interquartile range), as appropriate. Graphical representations in the form of bar graphs & histograms are used for effective understanding of data. The primary outcome was the improvement in quantifying Dyspnea (through the Dyspnea grading scale), SpO₂ levels, and oxygen requirement of the patient. The secondary outcome included assessment and evaluation of functional activity using various scales such as the Functional mobility scale (FMS), Functional Independence Measure (FIM), and Rating of Perceived Exertion (RPE) at the time of admission and the end of the rehabilitation program. The maximum oxygen taken into consideration was 4 lit and the minimum was 1lit. Physiotherapy along with a balanced diet for the patients, mostly high protein, low carbohydrates, and high fiber diet was recommended in reducing sugar levels in the blood and controlling the weight of patients.

STATISTICAL ANALYSIS

Data were analyzed using the Microsoft Excel spreadsheet followed by Statistical Package for the Social Sciences (SPSS).

RESULT

As observed in table 1, 30 post-COVID-19 patients' complete data undergoing rehabilitation, was collected. Based on the inclusion and exclusion criteria, the sample selected for the study was N=30. The

eliminated N=5 subjects pertained to the exclusion criteria. The Mean age group of subjects in the study was 62.37 years. There were male N=27 and female N=3 patient cases analyzed. Co-morbidities of Diabetes (N=6), Hypertension (N=4), and both Diabetes & Hypertension (N=12) were present in the subjects. The Mean of SpO₂ levels among subjects (N=30) during admission was 0.96 with a maximum of 1.00 and a minimum of 0.91. The Mean of SpO₂ levels among subjects (N=30) during discharge was 0.97 with a maximum of 1.00 and a minimum of 0.94. The Mean weight of subjects (N=30) during admission was 73.68 kgs with a maximum of 103.0 kgs and a minimum of 49.0 kgs. The Mean weight of subjects (N=26) during discharge was 71.97 kgs with a maximum of 104.8 kgs and a minimum of 45 kgs.

Table 1: Summary Statistics of Demographics of All Subjects

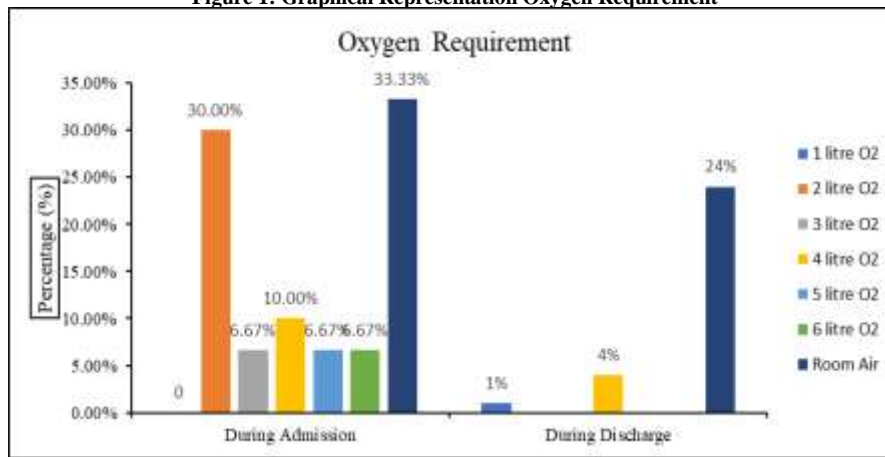
PARAMETER	Count (N= 30)
Age (Years)	
N	30
Mean	62.37
Standard deviation	10.05
Minimum	46.00
Maximum	84.00
Gender, n (%)	
Male	27 (90.00 %)
Female	03 (10.00 %)
Co-morbidities	
Diabetes	06 (20.00 %)
Hypertension	04 (13.33 %)
Diabetes + Hypertension	12 (40.00 %)
Do Not Available	08 (26.67 %)
SPO₂ Levels (%)	
DURING ADMISSION	
N	30
Mean	0.96
Standard deviation	0.021
Minimum	0.91
Maximum	1.00
DURING DISCHARGE	
N	26
Mean	0.97
Standard deviation	0.014
Minimum	0.94
Maximum	1.00
Weight	
N	30
Mean	73.68
Standard deviation	13.17
Minimum	49.00
Maximum	103.00
DURING DISCHARGE	
N	26
Mean	71.97
Standard deviation	14.31
Minimum	45.00
Maximum	104.8

As observed in Table 2 & figure 1, during admission, a total of N=30 subjects out of which N=2 subjects (6.67%) required 1 litre of O₂, N=9 subjects (30.00%) required 2 litre of O₂, N=2 subjects (6.67%) required 3 litre O₂, N=3 subjects (10.00%) required 4 litre O₂, N=2 subjects (6.67%) required 5 litre O₂, N=2 subjects (6.67%) required 6 litre O₂ and N=10 subjects (33.33%) were on room air. During Discharge, a total of N=30 subjects out of which N=1 subject (3.84%) required 1 litre O₂, N=1 subject (3.84%) required 4 litre O₂ and N=24 subjects (92.30 %) were on room air.

Table 2: Summary Statistics of Oxygen requirement

PARAMETER	Count (N= 30)
DURING ADMISSION	
1 litre O ₂	2 (6.67 %)
2 litre O ₂	9 (30.00 %)
3 litre O ₂	2 (6.67 %)
4 litre O ₂	3 (10.00 %)
5 litre O ₂	2 (6.67 %)
6 litre O ₂	2 (6.67 %)
Room Air	10 (33.33 %)
DURING DISCHARGE	
1 litre O ₂	1 (3.84 %)
4 litre O ₂	1 (3.84 %)
Room Air	24 (92.30 %)
Data Not Available	04 (13.33 %)

Figure 1: Graphical Representation Oxygen Requirement



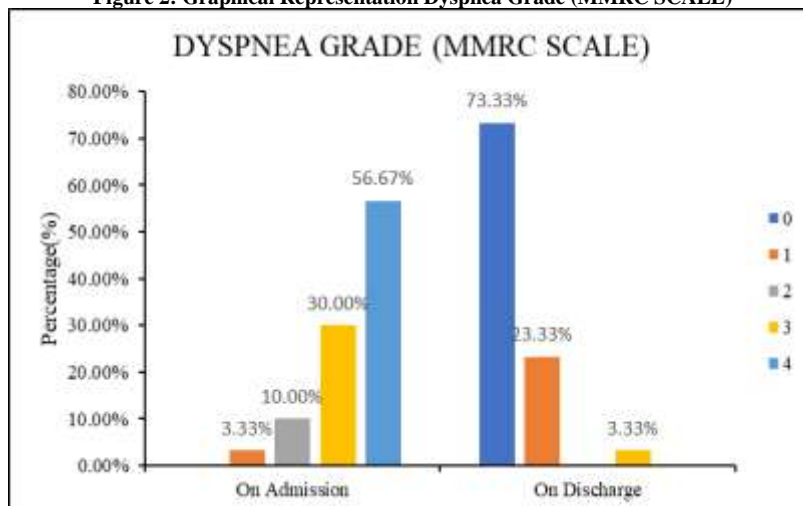
As observed in Table 3 & figure 2, During admission, A Dyspnea Grading Scale (MMRC Scale) has been used to assess the level of disability that breathlessness poses in daily activities in post-COVID-19 patients. A total of N=30 subjects out of which N=1 subject (3.33%) scored the value of 1, N=3 subjects (10.00%) scored the value of 2, N=9

subjects (30.30 %) scored the value of 3, N=17 subjects (56.67%) scored the value of 4. During discharge, a total of N=30 subjects out of which N=22 subjects (73.33%) scored the value of 0, N=7 subjects (23.33%) scored the value of 1, & N=1 subject (3.33 %) scored the value of 3.

Table 3: Summary Statistics of Dyspnea Grade (MMRC SCALE)

PARAMETER	Count (N= 30)
On Admission	
1	1 (3.33 %)
2	3 (10.00 %)
3	9 (30.00 %)
4	17 (56.67 %)
On Discharge	
0	22 (73.33 %)
1	07 (23.33 %)
3	01 (3.33 %)
Note: GRADE 0- NO DYSPNEA EXCEPT WITH STRENUOUS EXERCISES. GRADE 1- DYSPNEA WHEN WALKING UP AN INCLINE /HURRYING ON THE LEVEL. GRADE 2- WALK SLOWER THAN MOST ON THE LEVEL /STOP AFTER 15 MINUTES OF WALKING ON THE LEVEL. GRADE 3- STOP AFTER A FEW MINUTES OF WALKING ON THE LEVEL. GRADE 4- WITH MINIMAL ACTIVITY SUCH AS GETTING DRESSED TOO DYSPNEA TO LEAVE THE HOUSE /ROOM	

Figure 2: Graphical Representation Dyspnea Grade (MMRC SCALE)



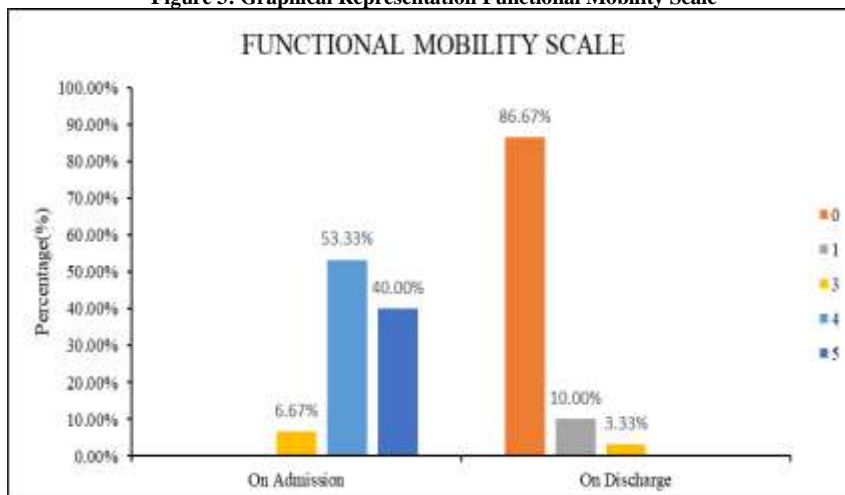
As observed in Table 4 & figure 3, During Admission, the Functional Mobility scale (FMS) has been used in the study as a performance measure post-COVID-19. A total of N=30 subjects out of which N=2 subjects (6.67%) scored the value of 3, N=16 subjects (53.33%) scored the value of 4, and

N=12 subjects (40.00 %) scored the value of 5. During discharge, a total of N=30 subjects out of which N=26 subjects (86.67%) scored the value of 0 indicating Full activity, while N=3 subjects (10.00%) scored the value of 1, & N=1 subject (3.33 %) scored the value of 3.

Table 4: Summary Statistics of Functional Mobility Scale

PARAMETER	Count (N= 30)
On Admission	
3	2 (6.67 %)
4	16 (53.33 %)
5	12 (40.00 %)
On Discharge	
0	26 (86.67 %)
1	03 (10.00 %)
3	01 (3.33 %)
Note: GRADE 0- FULL ACTIVITY GRADE 1-WALKING WITH ASSISTANCES GRADE 2-WALKING WITH ASSISTANCES FOR SHORT PERIODS GRADE 3-WALKING WITH ASSISTANCE FOR ACTIVITIES OF DAILY LIVING /APPOINTMENTS ONLY GRADE 4-CONFINED TO WHEELCHAIR GRADE 5-BED RIDDEN	

Figure 3: Graphical Representation Functional Mobility Scale



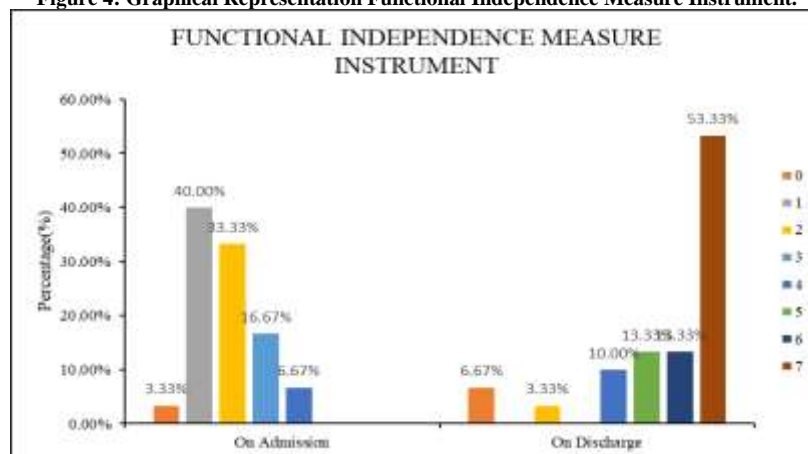
As observed in Table 5 & figure 4, During Admission, the Functional Independence Measure (FIM) has been used as a tool for measuring the level of assistance an individual needs to grade functional status from total independence to assess a patient's level of disability as well as a change in patient status in response to rehabilitation post-COVID-19. A total of N=30 subjects out of which N=1 subject (3.33%) scored the value of 0, N=12 subjects (40.00%) scored the value of 1, N=10 subjects (33.33 %)

scored the value of 2, N=5 subjects (16.67%) scored the value of 3, N=2 subjects (6.67%) scored the value of 4. During discharge, a total of N=30 subjects out of which N=2 subjects (6.67%) scored the value of 0, N=1 subject (3.33%) scored the value of 2, & N=3 subjects (10.00 %) scored the value of 4, N=4 subjects (13.33 %) scored the value of 5, N=4 subjects (13.33%) scored the value of 6, and N=16 subjects (53.33%) scored the value of 7 (complete independence).

Table 5: Summary Statistics of Functional Independence Measure Instrument

PARAMETER	Count (N= 30)
On Admission	
0	01 (3.33 %)
1	12 (40.00 %)
2	10 (33.33 %)
3	05 (16.67 %)
4	02 (6.67 %)
On Discharge	
0	02 (6.67 %)
2	01 (3.33 %)
4	03 (10.00 %)
5	04 (13.33 %)
6	04 (13.33 %)
7	16 (53.33 %)
Note: GRADE 1- TOTAL ASSISTANCE (Subject=Less than 25%) GRADE 2- MINIMAL ASSISTANCE (Subject=25%+) GRADE 3- MODERATE ASSISTANCE (Subject=50%+) GRADE 4- MINIMAL ASSISTANCE (Subject=75%+) GRADE 5- SUPERVISION (Subject=100%+) GRADE 6- MODIFIED INDEPENDENCE (Device) GRADE 7- COMPLETE INDEPENDENCE (Timely, Safely)	

Figure 4: Graphical Representation Functional Independence Measure Instrument.



As observed in Table 6 & figure 5, During Admission, the Rate of Perceived Exertion (RPE) has been used as a tool for measuring the physical activity intensity level in response to rehabilitation post-COVID-19. A total of N=30 subjects out of which N=1 subject (3.33%) scored the value of 3, N=1

subject (3.33%) scored the value of 4, N=8 subjects (26.67 %) scored the value of 5, N=15 subjects (50.00%) scored the value of 7, N=5 subjects (16.67%) scored the value of 10. During discharge, a total of N=30 subjects out of which N=12 subjects (40.00%) scored the value of 0, N=5 subjects

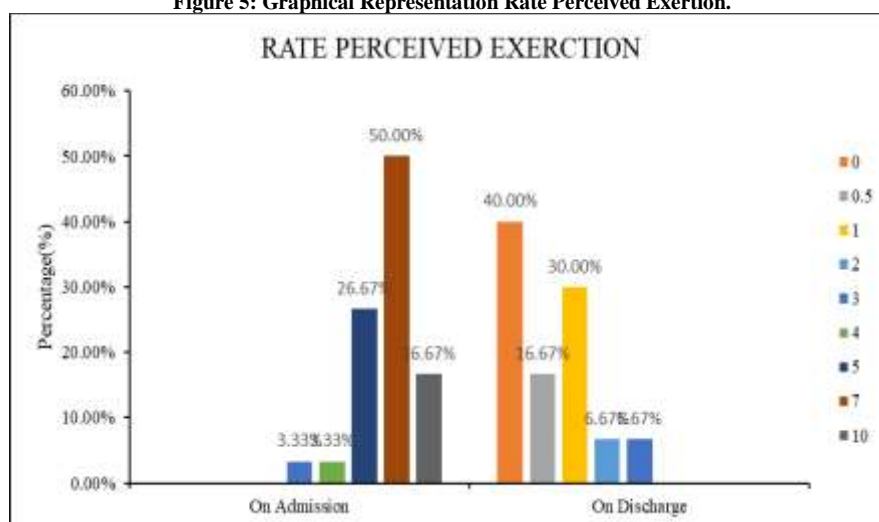
(16.67%) scored the value of 0.5. N=9 subjects (6.67%) scored the value of 2, and subjects (30.00 %) scored the value of 1, N=2 N=2 subjects (6.67%) scored the value of 3.

Table 6: Summary Statistics of Rate Perceived Exertion.

PARAMETER	Count (N= 30)
On Admission	
3	01 (3.33 %)
4	01 (3.33 %)
5	08 (26.67 %)
7	15 (50.00 %)
10	05 (16.67 %)
On Discharge	
0	12 (40.00 %)
0.5	05 (16.67 %)
1	09 (30.00 %)
2	02 (6.67 %)
3	02 (6.67 %)

Note: GRADE 0- NOTHING AT ALL
 GRADE 0.5- JUST NOTICEABLE
 GRADE 1- VERY LIGHT
 GRADE 2- LIGHT
 GRADE 3- MODERATE
 GRADE 4- SOMEWHAT HEAVY
 GRADE 5 – HEAVY
 GRADE 7 – VERY HEAVY
 GRADE 10 – VERY IS VERY HEAVY

Figure 5: Graphical Representation Rate Perceived Exertion.



DISCUSSION

In a study conducted by Eirini et al. [10] with a group of 11 post-COVID-19 patients, the physiotherapy method was tailored to their needs and objectives. SpO₂ at ICU Discharge the mean value of SpO₂ is 90.3 (1.7), But at Hospital Discharge the mean value of SpO₂ is 97.2 (1.1), i.e., indicating the improvement. Likewise, in our study, The Mean of SpO₂ levels among subjects during admission was 0.96 with a maximum of 1.00 and a minimum of 0.91 and during discharge it was 0.97 with a maximum of

1.00 and a minimum of 0.94, showing a significant improvement.

Eirini et al. [10], conducted a study with a group of 11 post-COVID-19 patients, The Borg Scale (intensity of Dyspnea), used to rate their level of SOB, was employed. Dependent sample t-tests revealed that the suggested physiotherapy treatment had a substantial impact (p 0.001) on respiratory variables (SpO₂, respiratory rate, Borg scale score). At ICU Discharge the mean value of the Borg Dyspnea scale is 7.5, i.e., very severe, But at Hospital Discharge the mean value of the Borg Dyspnea Scale is 2.5, i.e.,

slight to moderate. Likewise, in our study, a total of 30 subjects, 22 scored the value of 0 i.e., No dyspnea except with strenuous exercises, 7 subjects scored the value of 1 i.e., Dyspnea when walking up an incline, 1 subject scored the value of 3 i.e., to stopping after few minutes of walking on the level using the Dyspnea grading scale (MMRC Scale)

The Manchester Mobility Score (MMS), was used in a noninterventional observational trial by David et al. [9] on Covid-19 patients admitted to the ICU. The individuals had a median Manchester Mobility Score of 5 (interquartile range: 4-6) upon ICU discharge, indicating that they could stand and move around to a chair on their own or with assistance. Similarly, in our study, during discharge, a total of 30 subjects out of which 26 (86.67%) scored the value of 0 indicating Full activity, while 3 subjects scored the value of 1 & one subject (3.33 %) scored the value of 3, using the FMS scale.

After 2 weeks of pulmonary rehabilitation, disability (FIM score in post-COVID patients pre: 100 (15.1); post: 111 (15); $p < 0.0001$) improved in COVID-19 Patients, according to a study by Spielmann et al. [12]. In similarity with our study, during discharge, a total of 30 subjects out of which 16 subjects scored the value of 7 i.e., indicating as they achieved complete independence. 4 subjects (13.33 %) scored the value of 5 indicating as they still required supervision, and 4 subjects (13.33%) scored the value of 6, indicating modified independence in performing their ADLs, using the FIM scale

Following regional standard operating procedures, Pierachille et al [13] real-world observational study of 20 COVID-19 patients were carried out for 15 days following discharge. At discharge (12.8), the Borg RPE mean score during exertion was considerably lower than on Day 15 at the hospital (14.3). The patients becoming more active is likely the cause of the increased mean Borg RPE score on Day 15 compared to that upon hospital discharge. Similarly in our study, during discharge, a total of 30

subjects out of which 12 subjects (40.00%) scored the value of 0, indicating no exertion on Physical activity, 5 subjects (16.67%) scored the value of 0.5, indicating noticeable exertion on physical activity N=9 subjects (30.00 %) scored the value of 1, indicating a little exertion on Physical activity using RPE Scale.

CONCLUSION

The purpose of this study was to examine the effects of Physiotherapy in rehabilitation in Post Covid-19 Patients. Despite the limited study population, we were able to demonstrate significant results as the physiotherapists provided patients with personalized exercises and training that met their needs and preferences. The above-mentioned scales, data on each patient's O2 support, mobility status, and independence regarding ADLs have all been improved gradually over the study period, as evidenced by the outcomes that were disclosed by our statistical analysis. By the completion of the rehabilitation program, approximately 92.30% of patients were on room air, 73.33% gained no dyspnea, 86.67% achieved full activity, and 40.00% gained no exertion with physical activity. Whereas 53.33% gained complete independence of ADLs and by Day 6 of physiotherapy, most patients who required oxygen support became independent, while a few remained dependent on it. The independent ones were discharged after data collection. Moreover, half of the patients doing their ADLs independently by Day 11 and needed little to no support. A sum of 22 patients was discharged. On the 14th day of the study, 30 patients were discharged independently whereas the remaining one had pre-existing ILD, and the other two had Atelectasis, 3 still required very minimal support during strenuous activities or sleep.

This study reaffirms the substantial data supporting the efficacy of physical therapy rehabilitation in reaching its full potential. However, larger studies can answer its long-term effectiveness in treating post-COVID-19 patients.

List Of Abbreviations:

ADLs- Activities of Daily Living
HRQoL- Health-Related Quality of Life
SOB- Shortness of Breath
FMS- Functional Mobility scale
FIM- Functional Independence Measure
RPE- Rate of Perceived exertion.
ILD- Interstitial Lung Disease

Declaration by Authors

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