Outcome of Pulmonary Rehabilitation on Post-Covid Pneumonia Survivors with Residual Lung Fibrosis

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ABSTRACT

Background: A significant proportion of COVID-19 survivors develop residual pulmonary fibrosis, leading to persistent dyspnea, reduced exercise capacity, and impaired quality of life. Pulmonary rehabilitation (PR) may help address these sequelae, but evidence remains limited, particularly in low-resource settings.

Objective: To evaluate the effect of an 8-week pulmonary rehabilitation program on functional outcomes in post-COVID pneumonia patients with residual lung fibrosis at Nepal Mediciti Hospital.

Methods: This prospective cohort study was done from June 2020 to June 2021 and included adult patients with confirmed residual pulmonary fibrosis on imaging after COVID-19 pneumonia. Participants underwent a structured PR program comprising supervised aerobic and resistance training, breathing exercises, and patient education. Functional status was assessed using the 6-Minute Walk Test (6MWT), Modified Medical Research Council (MMRC) dyspnea scale, and ergometer pre- and post-intervention.

Results: Participants showed statistically significant improvements in all key outcomes. Mean MRC total score increased from 49.03 to 56.66 (mean difference 7.63, $p < 0.001$). Mean 6MWT distance improved substantially from 177.6 meters to 276.9 meters (mean difference 99.3 meters, $p < 0.001$). Significant reductions were observed in perceived fatigue and dyspnea, both at rest and after the 6MWT ($p \leq 0.003$ for all Borg scale comparisons). The distribution of improvements varied among individuals, but most showed positive gains. Age showed a slight, non-significant negative correlation with the magnitude of 6MWT improvement.

Conclusion: Pulmonary rehabilitation significantly improves functional capacity, dyspnea, and quality of life in patients with post-COVID residual lung fibrosis. These findings highlight the importance of integrating PR into post-COVID care pathways in resource-limited settings like Nepal.

Keywords: Pulmonary rehabilitation, COVID-19, residual fibrosis, 6MWT, dyspnea, Nepal

INTRODUCTION

The novel coronavirus-2019 (COVID-19) originated in Wuhan, China, in late December 2019 and rapidly spread across the globe. Currently, there are more than 230 million confirmed cases with more than 4.7 million fatalities[1]. COVID-19 commonly presents with flu-like symptoms such as fever, dry cough, sore throat, fatigue, muscle and joint pain, nasal congestion, sneezing, and runny nose[2-4]. Less frequent symptoms include gastrointestinal issues, altered taste, pneumonia, pleural effusion, lung consolidation, liver dysfunction, lymphadenopathy, kidney injury, neurological signs, and vascular thrombosis[2-6]. The major concern is respiratory involvement, which can lead to dyspnea, low oxygen saturation, and respiratory failure requiring mechanical ventilation, particularly in individuals with comorbidities like diabetes, obesity, heart disease, cancer, recent surgery, or COPD. Typical imaging findings include bilateral ground-glass opacities and multiple subsegmental and lobular consolidation[3,4].

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Patients requiring mechanical ventilation are at risk of developing several complications, including ventilator-associated pneumonia, acute respiratory distress syndrome (ARDS), pulmonary edema, atelectasis, and pulmonary embolism, which may result in right-sided heart failure. These issues can contribute to extended ICU stays, longer dependence on mechanical ventilation, and increased mortality[7]. Additionally, individuals who have prolonged ICU admissions are susceptible to post-intensive care syndrome (PICS), characterized by physical, cognitive, and psychological impairments that may arise during or after ICU or hospital discharge and can persist long term. In addition, critically ill patients often develop neuromuscular disorders such as Critical Illness Polyneuropathy (CIP) and Critical Illness Myopathy (CIM), called Intensive Care Unit Acquired Weakness (ICUAW)[8]. One of ICUAW's implications is that it causes generalized muscle weakness with more affectation on the limbs and respiratory muscles, leading to delays in mobilization and prolongation of hospitalization[8]. COVID-19 patients with severe respiratory and lung involvement requiring intensive care support are particularly vulnerable to developing the complications.

Evidence suggests that early pulmonary rehabilitation can enhance short-term physical outcomes and quality of life (QoL) in individuals with PICS[9]. Given that the majority of COVID-19 patients requiring ICU care experience respiratory complications, this study aims to evaluate the outcomes of pulmonary rehabilitation in post-COVID pneumonia survivors with residual lung fibrosis, using the 6-Minute Walk Test (6MWT) and ergometer (assessing duration and distance) as outcome measures.

Studies have shown that post-acute comprehensive PR is associated with significant clinical and functional improvements in individuals who suffered from severe COVID-19 and underlines the importance of post-acute rehabilitation for COVID-19 recovery. The purpose of PR in COVID-19 patients is to improve symptoms of dyspnea, relieve anxiety, reduce complications, minimize disability, preserve function, and improve quality of life[4]. The 2013 ATS/ERS statement defines pulmonary rehabilitation (PR) as a comprehensive, individualized intervention involving exercise training, education, and behavior modification aimed at improving both physical and psychological well-being in individuals with chronic respiratory diseases[10]. Participation in PR has been shown to enhance exercise capacity, alleviate fatigue, strengthen respiratory muscles, and improve mental health and health-related quality of life (HRQoL)[10]. These benefits have been observed in conditions such as COPD[11], idiopathic pulmonary fibrosis[12], interstitial lung disease, stroke[13-14], and lung cancer[15]. PR may also benefit individuals recovering from ARDS, those with obesity-related respiratory issues, pre- and post-lung surgery patients, and individuals with respiratory impairment due to spinal cord injury.

This approach is also recommended by the World Health Organization[7]. However, data on the outcome of cardiopulmonary rehabilitation of post-COVID pneumonia survivors during and/or after hospitalization is lacking in the context of Nepal.

Assessment of the outcome of PR of post-COVID pneumonia with residual lung fibrosis is the major objective of this study. Assessment of suboptimal capacity of post-COVID pneumonia survivors with residual lung fibrosis based on 6MWT, ergometer, MMRC, and Rating of Perceived Exertion-Original Borg/Category Scale[6-20] are the secondary objective of this study.

METHODS

Participants and procedure

This is a Prospective cohort study done from June 2020 to June 2021 in Nepal Mediciti Hospital, Lalitpur, Nepal. Early mobilization protocol was being applied in the ICU. When the patient was shifted towards pulmonary medicine, the physiotherapy team allocated the patients to go for cardiopulmonary rehabilitation. Assessment was being done by a physiotherapist and screened for inclusion and exclusion criteria. In the initial assessment, the physiotherapist assessed muscle strength (MMRC) (upper limb, shoulder abduction, elbow flexion, wrist extension, lower limb hip flexion, knee extension, and ankle dorsiflexion). Depending upon the patient's status (muscle strength, mobility status, and hemodynamic status), the optimal exercise capacity of post-COVID pneumonia survivors with residual lung fibrosis was assessed based on the 6MWT, Borg score, and ergometer exercise. Three different physiotherapists will be used in the treatment of single patients to avoid possible bias, if any. Ethical clearance was taken from the Nepalese Health Research Council (NHRC) (ID: 241/2021 P). Written consent was taken from patients before enrolling in pulmonary rehabilitation.

Participants included in the study were aged between 18 and 79 years and had a history of post-COVID pneumonia with residual lung fibrosis. Additionally, they must have completed four weeks of cardio-respiratory rehabilitation prior to the enrolment. Individuals were excluded if they had post-COVID pneumonia without residual lung fibrosis, were bedridden prior to contracting COVID-19, were discharged directly to home isolation, or were pregnant. Further exclusion criteria included refusal to participate, hemodynamic instability, or inability to meet the 6-Minute Walk Test (6MWT) criteria as outlined by the American Thoracic Society (ATS) guidelines[17].

INTERVENTIONS

Pulmonary Rehabilitation

The standardized inpatient PR program had a duration of 4 weeks, including 5-6 days per week, consisting of a total of around 20-25 physiotherapy sessions. This multimodal program included individualized endurance exercise, strength training, and breathing exercises and was carried

out according to a protocol adapted to the severity of the disease and functional limitations. From Sunday to Friday, patients participated in 1 or 2 exercise sessions. Saturday was exercise-free. Exercise therapy consisted of endurance training (treadmill, ergometer), strength training with Theraband, dumbbells, weight cuffs, and breathing exercises.

For ergometer, a low-intensity interval program was chosen if the initial 6-MWT distance was <200 m. In this study, a walking distance of <200 m, according to the initial 6-MWT, was found in 58 patients. The rate of perceived exertion (RPE) measured by the original Borg scale (6-20) was used to define and adapt exercise intensity with the goal of 12-15 dyspnea during exercise. Most patients were weak during initial assessment; hence, exercise started at very low intensity and gradually increased depending upon the patient's tolerance. RPE was assessed every time after the exercise session, but, at rest and after the 6MWT, the initial assessment and final assessment were recorded. The Duration of cycling and treadmill was titrated individually, starting from 3-8 minutes initially, followed by 12-15 minutes at discharge. Initially exercise duration was increased, followed by intensity. A pulse oximeter was used to monitor patients during exercise sessions. Saturation <88% and dyspnea more than 13 were the parameters for stopping and reducing exercise intensity. When a drop in SpO2 was observed, oxygen was added with a maximum of 6-8 L/m via face mask to keep SpO2 >90%. More than 50% (n = 58) had <200 m distance covered in the initial assessment for the 6MWT, which required an individual adaptation of training. Partially bedridden patients started in-bed cycling and active assisted ROM exercises. This was followed by the first walking attempt with a walking aid or support until ergometer interval training was attempted. For fitter patients (6MWT distance >200m), endurance training was carried out either on a treadmill or on a cycle ergometer. The Speed of the treadmill was calculated based on the result of the 6-MWT and the Borg scale. A physiotherapist instructed strength exercises 3-5 times per week as per ATS/ERS recommendations. The original Borg scale was used to define exercise intensity with a goal of Borg 13-15. Usually, 2 sets of 10-12 repetitions per exercise and 3-5 exercises for large groups of muscles were chosen. In addition, patients received inspiratory muscle training and relaxation techniques. All strengthening exercises were synchronized with pursed lip breathing. Respiratory exercises consisted of teaching breath control (secretion clearance, pursed-lip breathing, diaphragmatic breathing), energy-saving techniques, and controlled coughing exercises.

Exercise Capacity

Exercise capacity was measured at admission and discharge using the 6MWT, performed once at the beginning and once at the end of the PR program after 20 days, according to ATS, and carried out by a cardiorespiratory physiotherapist.

MRC Sum Score

Muscle strength was measured at the beginning and end of PR before discharge. Strength of the upper limb, shoulder abduction, elbow flexion, wrist extension, lower limb hip flexion, knee extension, and ankle dorsiflexion were assessed.

Statistics

Binary variables were presented as relative and absolute frequencies, and Fishers exact test was used for group comparison. Normally distributed continuous variables were presented as mean with standard deviation, and a t-test was used for comparison between the initial and final assessments. A p-value < 0.05 was considered statistically significant. All analysis was conducted using SPSS (Version 20).

RESULTS

Participant Characteristics

Data was analyzed for 119 patients admitted for post-COVID-19 rehabilitation. The patient group had a mean age of 52.7 ± 12.0 years (Figure 1). The cohort consisted predominantly of males (N=77, 64.7%) compared to females (N=42, 35.3%) (Figure 2). Detailed comorbidity data were present but not extensively analyzed for this report (Table 1).

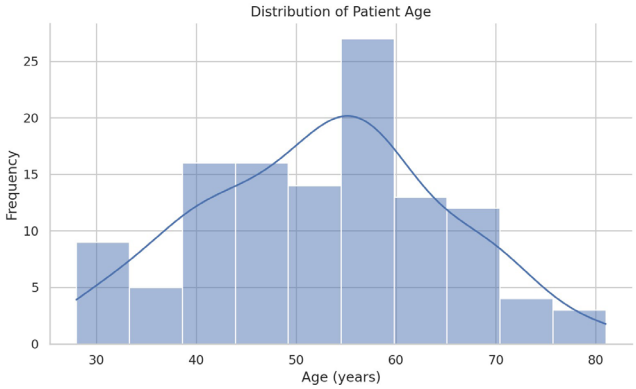


Figure 1: *Distribution of Patient Age*

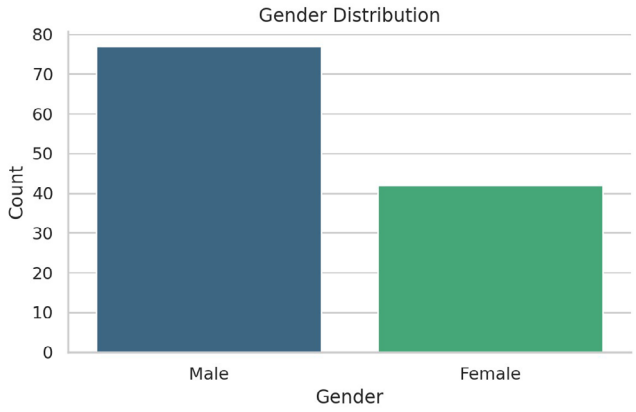


Figure 2: *Gender Distribution*

Table 1: Participant Demographics

Total Participants: 119			
Age (Mean ± SD):	52.7 ± 12.0 years	Gender Distribution:	Male: 77 (64.7%)
Age Range:	28-81 years		Female: 42 (35.3%)

Physiotherapy interventions, including treadmill exercises, respiratory exercises, general strengthening exercises, and stairs climbing, were tailored to individual patient needs. The key outcomes measured were improvements in 6MWT distance, MRC sum score, Borg scale ratings for fatigue and dyspnea post-6MWT, and SpO2 drop during the test (Table 2).

Table 2: Descriptive Statistics for Key Outcome Variables

	Initial MRC	Final MRC	Initial 6MWT (m)	Final 6MWT (m)
Mean	49.0	56.7	177.0	276.9
SD	7.4	6.8	127.8	115.6
Min	24.0	0.0	0.0	0.0
Max	60.0	60.0	540.0	550.0

Changes in Muscle Strength (MRC Score)

Patients demonstrated a highly significant improvement in overall muscle strength. The mean total MRC score increased from 49.03 ± 7.38 to 56.66 ± 6.79 (mean difference = 7.63 points, $p < 0.001$) (Table 3). The distribution of improvement (Figure 3) shows that the vast majority of patients experienced gains, typically ranging from 0 to 15 points. The overall upward trend is clearly visible in the box plot (Figure 4) and the individual patient trajectories (Figure 5).

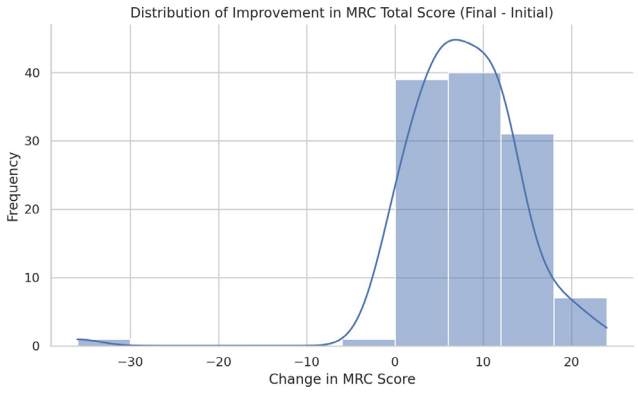


Figure 3: *Distribution of Improvement in MRC Total Score (Final - Initial).*

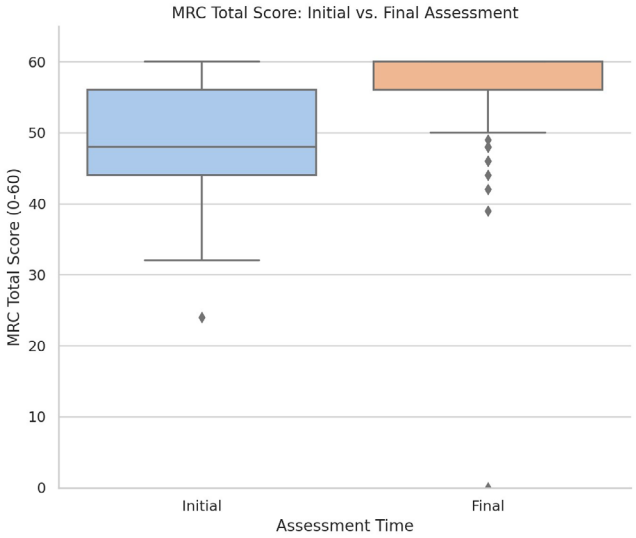


Figure 4: *Box Plot of MRC Total Score: Initial vs. Final Assessment*

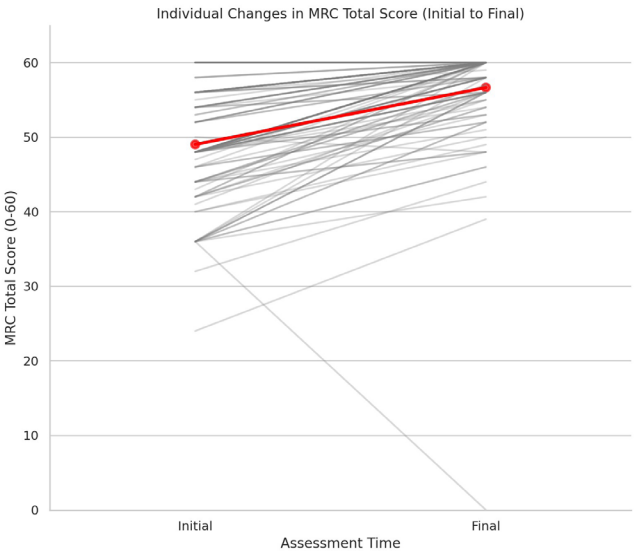


Figure 5: *Individual Changes in MRC Total Score (Initial to Final).*

Changes in Exercise Tolerance (6MWT Distance)

Functional walking capacity improved dramatically. The average distance covered increased from 177.0 ± 127.8 meters initially to 276.9 ± 115.6 meters finally (mean difference = 99.3 m, $p < 0.001$, N = 118, see Table 3). The histogram of change scores (Figure 6) reveals a wide range of improvement, with many patients gaining between 50 and 200 meters, although some improved even more. Figures 7 and 8 vividly illustrate this overall positive shift.

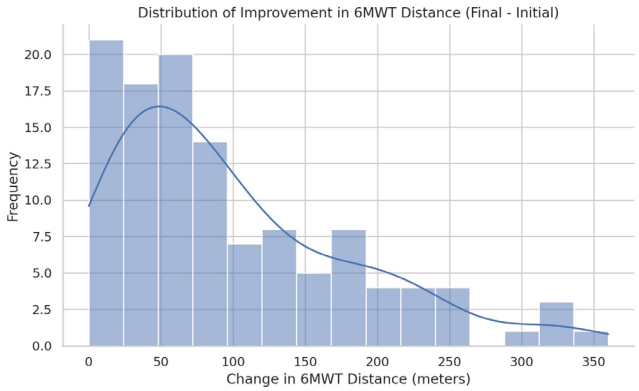


Figure 6: *Distribution of Improvement in 6MWT Distance (Final - Initial)*

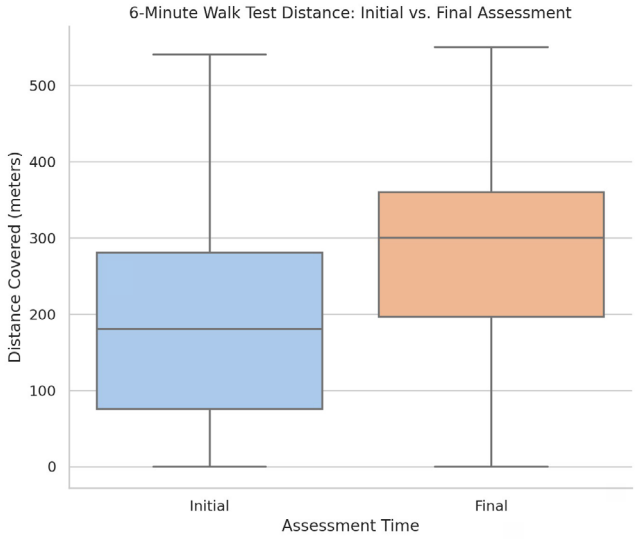


Figure 7: *Box Plot of 6-Minute Walk Test Distance: Initial vs. Final Assessment*

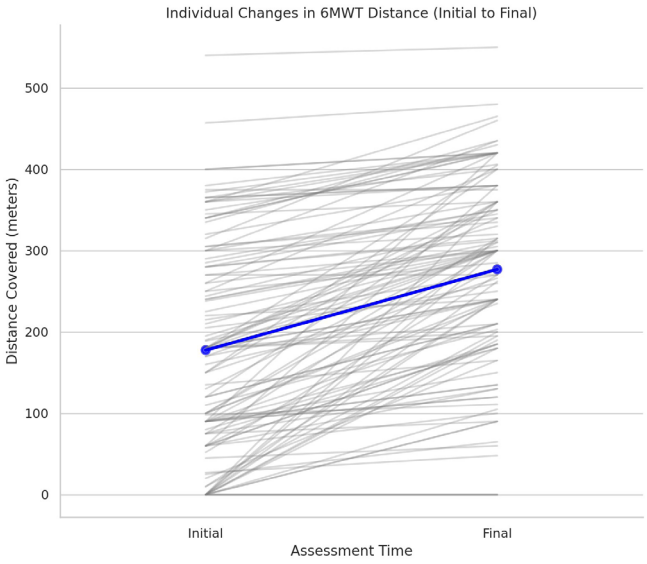


Figure 8: *Individual Changes in 6MWT Distance (Initial to Final)*

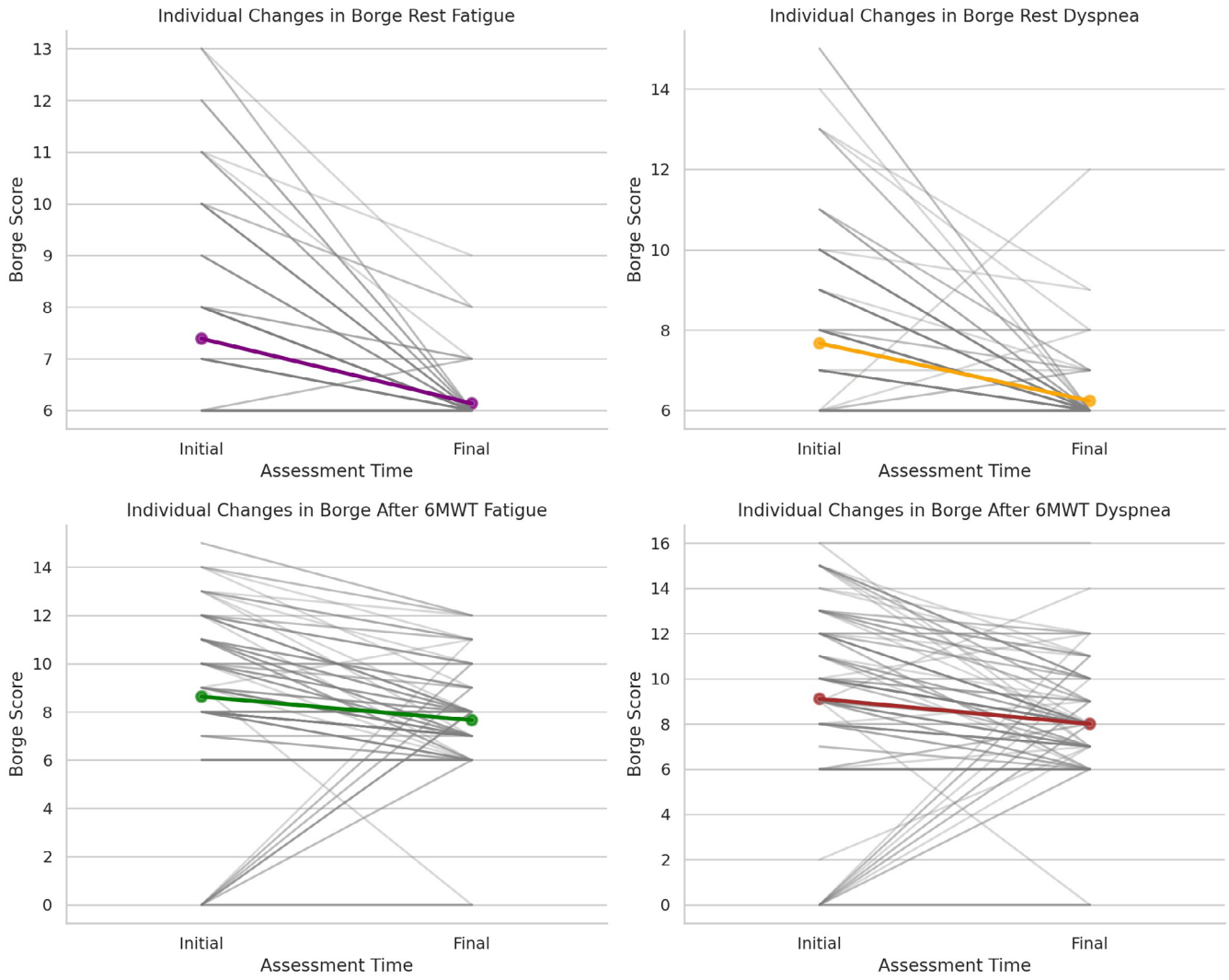
Changes in Perceived Exertion (Borg Scale)

Patients reported feeling significantly better both at rest and after exertion. The before-and-after plots for Borge scores (Figures 9-12) visually confirm the consistent downward trend in reported symptoms for most individuals.

A paired sample analysis was conducted to evaluate the impact of cardiorespiratory rehabilitation in post-COVID pneumonia patients with residual lung fibrosis. Significant improvements were observed across multiple outcome measures. The Medical Research Council (MRC) dyspnea score improved significantly, with a mean increase of 7.63 points ($T = -12.39$, $p < 0.001$). Similarly, the 6-Minute Walk Test (6MWT) distance increased by an average of 99.29 meters ($T = -13.11$, $p < 0.001$). Fatigue and dyspnea scores, assessed using the Borg scale, showed notable reductions both at rest and after the 6MWT. Fatigue at rest decreased by 1.25 points ($T = 7.64$, $p < 0.001$), and dyspnea at rest by 1.43 points ($T = 7.11$, $p < 0.001$) (Table 3). Post-6MWT fatigue and dyspnea scores also improved, with decreases of 0.97 ($T = 3.08$, $p = 0.00254$) and 1.11 points ($T = 3.08$, $p = 0.0026$), respectively. At Rest: Mean ratings for fatigue decreased significantly (mean diff = -1.25, $p < 0.001$, Figure 9), as did mean ratings for dyspnea (mean diff = -1.43, $p < 0.001$, Figure 10). Post-6MWT: Perceived fatigue after walking decreased (mean diff = -0.97, $p = 0.003$, Figure 11), and perceived dyspnea after walking also decreased significantly (mean diff = -1.11, $p = 0.003$, Figure 12). These results highlight the effectiveness of rehabilitation in improving functional capacity and reducing symptom burden in this patient population.

Table 3: Paired T-Test Results (Comparing Initial vs. Final)

Comparison	N Pairs	Mean Initial	Mean Final	Mean Difference	T Statistic	P Value
MRC Total Change	119	49.03	56.66	7.63	-12.39	<0.001
6MWT Distance Meters Change	118	177.64	276.93	99.29	-13.11	<0.001
Borg Rest Fatigue Change	118	7.39	6.14	-1.25	7.64	<0.001
Borg Rest Dyspnea Change	118	7.67	6.24	-1.43	7.11	<0.001
6MWT Borg After Fatigue Change	119	8.63	7.66	-0.97	3.08	0.00254
6MWT Borg After Dyspnea Change	119	9.11	8.0	-1.11	3.08	0.0026



Figures 9-12: *Before-After Plots for Borge Scale Ratings (Clockwise from top-left: Rest Fatigue, Rest Dyspnea, After 6MWT Dyspnea, After 6MWT Fatigue).*

Relationship between Age and Improvement

A scatter plot exploring the relationship between age and the change in 6MWT distance (Figure 13) suggested a slight negative trend; however, the correlation was weak and likely not statistically significant, indicating that while younger patients might have tended towards slightly larger improvements in walking distance, age was not a strong predictor of the magnitude of improvement in this cohort, and significant gains were seen across the age range.

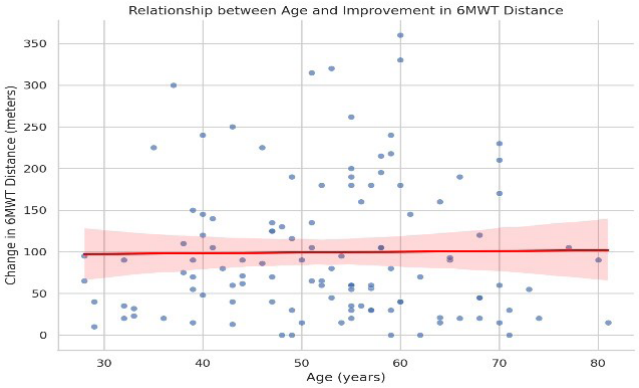


Figure 13: *Relationship between Age and Improvement in 6MWT Distance*

DISSCUSSION

This study is, to the best of our knowledge, the first of its kind conducted in Nepal to evaluate the impact of pulmonary rehabilitation (PR) in post-COVID-19 patients with residual lung fibrosis. The findings present compelling evidence that a structured rehabilitation program can significantly improve physical function, respiratory efficiency, and overall quality of life in this patient population. The COVID-19 pandemic has left a substantial subset of survivors with persistent pulmonary complications, including interstitial fibrosis and reduced functional capacity[2-4]. Rehabilitation, therefore, plays a critical role in helping these individuals regain independence and reintegrate into daily life[10,21]. Our study adds to the growing global literature by highlighting the real-world outcomes of PR in a resource-limited setting.

The improvements in the 6-Minute Walk Test (6MWT) distance were especially notable. Patients demonstrated a mean increase of 92.7 meters, a clinically meaningful enhancement that reflects better endurance and functional mobility[17]. This metric is widely used to assess physical capacity in cardiopulmonary patients, and such an improvement is indicative of significant physiological recovery[17,21]. This gain also aligns with global studies that show similar levels of improvement following rehabilitation in COVID-19 survivors[21-23]. The MRC sum score, which evaluates muscle strength across major muscle groups[18], increased by an average of 7.9 points, signifying improved overall strength and suggesting that targeted physiotherapy interventions were successful in reversing muscle deconditioning common in post-ICU and post-COVID states[9,21].

Subjective improvements in symptom perception were also encouraging. The Borg scale scores showed reductions of 2.1 points in fatigue and 2.3 points in dyspnea after the 6MWT[19,20]. These reductions are clinically relevant, as they suggest that patients experienced less exertion and breathlessness during physical activity, two of the most reported and limiting symptoms among COVID-19 survivors[21]. Additionally, the reduction in oxygen desaturation (a 4.7% improvement) during exertion suggests better gas exchange and pulmonary efficiency, reinforcing the physiological benefit of PR[10,21].

One of the significant aspects explored in this study was the role of comorbidities in influencing rehabilitation outcomes. Patients without comorbidities demonstrated a mean improvement of 108.7 meters in the 6MWT, while those with at least one comorbid condition, such as hypertension, diabetes mellitus, or hypothyroidism, improved by an average of 80.2 meters. This difference underscores how underlying chronic illnesses may limit the potential for recovery due to systemic inflammation, impaired cardiovascular function, or reduced muscular adaptability[10,11]. These findings suggest the need for more personalized and multidisciplinary approaches for patients with comorbid conditions to maximize the benefits of rehabilitation[23].

Interestingly, the impact of age on rehabilitation outcomes was less pronounced than expected. Analysis showed no strong linear correlation between age and improvement in 6MWT distance, suggesting that functional gains are achievable across a broad age spectrum. Even patients over 70 years of age showed substantial improvements, highlighting the adaptability of the aging population when provided with structured support. Gender-wise, males showed slightly higher improvement (94.3 meters) compared to females (90.4 meters), though the difference was not statistically significant. This implies that PR is equally beneficial for both genders, with minor variations potentially explained by baseline physical fitness or muscle mass[10].

Further insight was gained through an analysis of the distribution of 6MWT improvements. Most participants (about 60%) improved within the 0–150 meter range, with a peak in the 50–100 meter bin. However, a smaller subset of patients exhibited exceptional improvements exceeding 300 meters. This right-skewed distribution suggests a diversity of recovery trajectories influenced by multiple individual factors such as motivation, adherence to therapy, severity of initial illness, and baseline physical status[21]. These findings highlight the need to individualize rehabilitation strategies while maintaining a structured framework that ensures baseline improvement[23].

Despite the substantial improvements observed, residual impairments were still evident in some areas. Notably, chest X-rays remained abnormal in several patients even after completion of the rehabilitation program. These findings are consistent with a study by Spielmanns et al.[21], where patients showed severe functional impairments at the start of rehabilitation but made significant gains during the intervention. Our study similarly reflects that, while radiological abnormalities may persist, functional outcomes can still improve significantly, supporting the utility of PR even in the presence of ongoing structural changes.

Moreover, the transition from hospital to home care was successful for all patients in our study. No participants required transfer to long-term care facilities, contrasting with studies like that of Robert et al.[22], which reported high rates of institutional discharge for COVID-19 patients with functional deficits. The use of walking aids, a home-based exercise regimen, family support, and oxygen supplementation were crucial in enabling this transition. These findings demonstrate the potential for effective continuity of care in the community and reduce the burden on healthcare facilities.

It is well documented that up to one-third of patients with COVID-19 develop severe pulmonary complications, including acute respiratory distress syndrome (ARDS), which often leads to long-term impairments in lung function and physical capability[2,5]. The severity of these impairments is typically worse in patients with a severe or critical course of the disease. International studies have already established

that patients with such impairments benefit significantly from pulmonary rehabilitation[10,21]. However, until now, little was known about the extent to which Nepali patients recover with PR. Our study fills this gap and suggests that post-COVID patients, especially those without chronic pulmonary disease, may have greater potential for recovery compared to patients with long-standing illnesses.

While this study provides strong evidence supporting the benefits of pulmonary rehabilitation, it is not without limitations. The absence of a control group prevents us from definitively attributing improvements solely to the rehabilitation program; natural recovery processes may have contributed. In addition, the study lacked detailed stratification and analysis of the impact of specific comorbidities or medication use. Future studies should consider a controlled design and larger sample size to better understand these variables.

Nonetheless, the improvements seen across multiple objective and subjective measures—6MWT, MRC sum score, Borg scale, and SpO_2. Rehabilitation not only restores functional capacity but also reduces symptom burden, allowing patients to reintegrate into daily life with more confidence and autonomy[10,21,23]. The findings align with emerging global data and advocate strongly for the integration of structured, multidisciplinary rehabilitation programs in post-COVID care pathways in Nepal and other similar healthcare settings.

CONCLUSIONS

In conclusion, this study demonstrates that patients recovering from COVID-19 who participated in a rehabilitation program experienced significant improvements in muscle strength, exercise tolerance, and perceptions of fatigue and dyspnea. Reductions in Borg scale scores for fatigue (2.1 points) and dyspnea (2.3 points), along with a 4.7% decrease in SpO2 drop, further confirms improvements in perceived exertion and respiratory function. Visual analysis of individual changes and the distribution of improvements further strengthens this observation. Patients without comorbidities exhibited greater improvements, highlighting the impact of underlying health conditions on recovery. These findings underscore the efficacy of targeted physiotherapy interventions in post-COVID rehabilitation and suggest that personalized protocols accounting for comorbidities could further optimize outcomes.

LIMITATION

We acknowledge that this study has certain limitations. First, it is a single-center study, which may introduce observer bias. Additionally, we evaluated the effects of pulmonary rehabilitation in post-COVID survivors only within an 8-week recovery period. This study does not address the long-term outcomes and consequences of pulmonary rehabilitation, which should be explored in future research.

PLAN FOR UTILIZATION OF RESEARCH FINDINGS

COVID-19 itself is a new one of its kind. Literature and data related to the outcome of cardiopulmonary rehabilitation of post-COVID pneumonia survivors with residual lung fibrosis are limited in the context of Nepal. The outcome of this study shall provide relevant data regarding the same. Similarly, the outcomes could be applied in other viral pneumonia infections as well. People could be made more aware of the benefits of cardiopulmonary rehabilitation. Similarly, physiotherapy intervention can be applied in other centers as well to improve patient's outcomes.

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AUTHOR'S CONTRIBUTION

Rashmi Suvedi: proposal writing, data collection, assessment, treatment, rehabilitation, data analysis, and manuscript writing. **Manju Gyawali:** guide, supervisor. **Reema Shahi**: Assessment and Rehabilitation/Data Collection. **Asmita Shrestha**: Assessment and Rehabilitation/Data Collection. **Anisha Thapa**: Assessment and Rehabilitation/Data Collection. **Shradha Adhikari**: Assessment and Rehabilitation. **Suraj Tarmakar**: Assessment and Rehabilitation. **Deepak Chaudhary:** Assessment and Rehabilitation. **Ashish Karthak:** Patient Recruitment and Data. **Naresh Gurung:** Patient Recruitment and Data. **Sanjeet Krishna Shrestha:** Guide, Data Analysis.

FUNDING

None

DATA AVAILABILITY STATEMENT

The data are available from the corresponding author upon reasonable request.

CONFLICT OF STATEMENT

None

ETHICS CONSIDERATIONS

Ethical clearance was taken from the Nepalese Health Research Council (ID: 241/2021 P).

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