International Journal of Yoga, Physiotherapy and Physical Education
www.sportsjournal.in
ISSN: 2456-5067
Received: 09-06-2022, Accepted: 24-06-2022, Published: 10-07-2022
Volume 7, Issue 4, 2022, Page No. 5-10

Role of physiotherapy in managing long covid: A case study

Madhur Kulkarni[1*], Anish Angal[2], Vandana Motghare[3]
[1] Assistant Professor, Department of Cardiorespiratory Physiotherapy, Dr. APJ Abdul Kalam College of Physiotherapy, Pravara Medical Trust (DU), Loni, Ahmednagar, Maharashtra, India
[2] Intern, CMF's College of Physiotherapy, Pune, Maharashtra, India
[3] Head of Department of Physiotherapy, PGI YCM Hospital, Pune, Maharashtra, India

Abstract
COVID 19 pandemic has affected thousands of lives directly and indirectly. With newer evidence coming in to picture various symptoms can persist or appear after few weeks or months of acquiring SARS-CoV-2 infection, this termed as "Long COVID". Fatigue, cough, chest tightness, breathlessness, palpitations, myalgia and difficulty to focus are symptoms reported in long COVID. These symptoms impact their physical, mental, social life and quality of life negatively. In the present study, the authors describe a case of Long COVID in a 62-year-old male. The patient presented to the Physiotherapy department with symptoms like dyspnea on walking and stair climbing, early onset of fatigue, and overall reduced functional capacity thus diagnosed with Long COVID. A structured and individually tailored exercise protocol was designed based on the objective assessment and was administered for 4 weeks. Post exercise protocol re-assessment of outcome measures was done. The study concluded that physiotherapy interventions such as respiratory muscle training, exercise training showed improvement in the quality of life, depression score, functional capacity and reduction of the symptoms hampering his activities.

Keywords: long covid, physiotherapy, respiratory muscle training, quality of life, respiratory care, depression

Introduction
SARS-CoV-2 induced pneumonia can be classified in two stages *viz*. early and a late phase. The early phase consists of viral replication thereby direct virus-mediated tissue damage. This is followed by a late phase characterized by lung inflammation occurring due to triggered immune responses by the infected host cells finally leading to fibrosis [1]. The term long COVID was first used by Perego in social media to denote persistence of symptoms weeks or months after initial SARS-CoV-2. Long COVID is characterized by persistence of symptoms, even weeks or months after acquiring SARS-CoV-2 infection. Most commonly reported symptoms include fatigue, cough, chest tightness, breathlessness, palpitations, myalgia and difficulty to concentrate [2]. Mazza MG *et al*. has observed high incidence of psychiatric illness in COVID-19 survivors. These included Post Traumatic Stress Disorder (PTSD), major depression, and anxiety [3]. So, attention should be given to early detection and management of these illnesses. Pulmonary rehabilitation (PR) is a "comprehensive intervention based on a thorough patient assessment followed by patient-tailored therapies that include exercise training, education, and behavior change, designed to improve the physical and psychological condition of people with chronic respiratory disease and to promote the long-term adherence to health-enhancing behaviors" [4]. Evidence shows improvement in exercise capacity and functional capacity with pulmonary rehabilitation in patients with various lung diseases such as Chronic obstructive pulmonary disease (COPD), Idiopathic pulmonary fibrosis and pneumonia, etc. [5]. There is paucity of data regarding the role of physiotherapy in managing long COVID symptoms. Clinical studies on post-acute COVID-19 rehabilitation are still ongoing, several reports and guidelines provide recommendations for physiotherapeutic rehabilitation and are based on previous SARS/MERS experience as well as on recent data and patient case studies [6]. The present study was aimed to detect the effect of supervised individually tailored exercise program on improving symptoms of Long COVID.

Case Presentation
Patient History
Authors present the case of A 62-year-old male who presented to the physiotherapy OPD with chief complaints of intermittent dry cough, weakness and dyspnea on exertion especially in winters. Patient was diagnosed with COVID-19 and had anemia, leukocytosis, tachycardia, elevated D- dimer levels and IL-6 levels. Figure 1 shows chest x-ray during hospitalization. Complete dose of Remdesivir was administered to the patient. Patient had prolonged hospital stay for a month and was on oxygen support through Non-invasive ventilation [NIV] for 10

days, later on Non- Rebreather bag and mask ventilation [NRBMV] and later as dyspnea levels improved oxygen was administered through nasal prongs. Patient was discharged with home oxygen support. Patient reported of severe weakness post discharge.2 months post discharge CT scan (Figure 2) was done which had CORAD score of 6 and CT severity score of 9/25 suggesting of resolving stage of COVID-19. It took almost 6 months postdischarge to regain back the strength to perform all the functional activities. After 8 months of discharge patient resumed his outdoor routine but had experienced dyspnea during light activities and had to take breaks while walking and stair climbing.

Examination

Patient had Grade 1 dyspnea (MMRC scale) [7]. The patient had reduced chest expansion. 6-minute walk test was done in standard settings with all precautions and results are noted in table number 1 listed below. Quality of life assessment was done by WHOQoL-BREF [8]. Geriatric depression scale was administered to assess depression [9]. Values of scale and test are mentioned in the Table no 1 in the results section.

Fig 1: Chest x ray during hospitalization

Fig 2: CT scan Report after discharge from hospital

Materials and Methods

The study is a Case study done on one participant presented with symptoms of Long COVID. Study duration was 4 weeks in physiotherapy OPD. Ethical committee clearance was obtained from the institutional ethical committee. The participant was given a clear idea about the nature of the study and written informed consent was obtained. The materials used were BP apparatus, pulse oximeter, stopwatch, stethoscope, Inspiratory muscle trainer (Powerbreathe®), therabands of different colors and resistance, treadmill, chair, paper and pen.

Fig 3: Materials used

Treatment

Exercises for Long COVID include appropriate dyspnea relieving positions, respiratory muscle training, large muscle groups strengthening and aerobic training along with humidification as an adjunct. Goals of rehabilitation program are to improve the exercise capacity, reduce incidence of symptoms and improving quality of life. Objective pretreatment assessment was carried out using 6-minute walk test for determining the functional capacity, World Health Organization quality of life (WHOQoL-BREF) for determining the quality of life and Geriatric depression score to assess the mental status. After gathering the data an exercises program was designed and prescribed for 4 weeks.

Each week had 5 training days, 3 days of aerobic training and 2 days of strengthening and regular Respiratory muscle training.

Respiratory Muscle Training

It was performed with Powerbreathe® device and it composed of 30 repetitions in a session lasting 10-15 minutes [10] daily before the conditioning phase (figure 4) The patient was asked to sit straight in a chair and a nose clip was applied to prevent air leak from the nose. Then patient was asked to deep inhale and exhale through the mouth for 15 repetitions then take a break and again repeating the sequence for next 15repitiotions. He was explained the procedure and demonstration was given before starting the training. He was instructed to take break incase of any discomfort. The resistance was increase gradually week by week.

Fig 4: Respiratory Muscle training

Aerobic Training

Heart Rate Reserve [HRR] was calculated using Karvonen's formula [11]. Warm up for aerobic training included slow walking on treadmill was given for 10 minutes. Aerobic training intensity was progressed from 40% - 65 % of HRR. Aerobic conditioning included treadmill walking done for 20 minutes followed by cool down for 10 minutes using slow walking and stretching of large muscle groups (figure 5) followed by breathing exercises by Incentive spirometer.

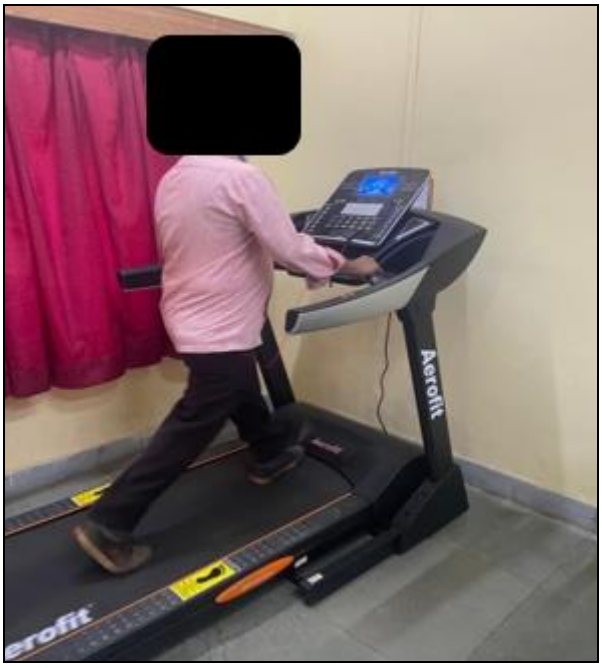

Fig 5: Aerobic training using treadmill

Strength Training

For Strength training warm up exercises included shoulder, wrist, and trunk rotations along with spot marching for 5 minutes. Strengthening of large muscle groups were done with different therabands. Cool down exercises such as muscle stretching was done.

Pre and post exercise vitals were checked and noted regularly. Adequate resting intervals were provided in between the protocol. Talk test was performed during each treadmill training day to access the relative intensity of the training.

Results and Discussion

The case study demonstrates improvement in parameters of 6MWT such as number of laps, Distance covered and estimated speed was observed. Improvement in quality of life and improvement in depression scores were also noted. Results of outcome measures pre and post exercise protocol are mentioned in the table number 1.

Table 1: Results of outcome measures pre and post exercise protocol

Outcome measures	Pre- protocol parameters	Post - protocol parameters
6 Minute walk test		
i) Number of laps	13	15
ii) 6MWD	399m	476m
iii) Standard estimated walking speed [12]	2.45 mph	3.02 mph
WHO-BREF scale		
i) Physical domain	50/100	56/100
ii) Psychological domain	44/100	56/100
iii) Social relationship domain	50/100	69/100
iv) Environmental domain	50/100	69/100
Geriatric depression scale score	3/15	0/15

Remarkable improvement was noted in exercise capacity after 4 weeks of physiotherapeutic intervention in terms of 6-minute walk test parameters. There was increase in number of laps and the total distance covered as well as improvement in the estimated walking speed suggesting that like other respiratory illnesses physiotherapeutic interventions in the form of aerobic and strength training along with respiratory muscle training proves to be effective in increasing exercise capacity after COVID 19.

Improvement in QoL score was also observed in all domains *viz*; physical, psychological, social and environmental domain and reduction in depression score by 3 points was noted after the intervention. The factors attributing to these includes improved exercise tolerance, reduced dyspnoea, improved mental wellbeing increased social interaction and raised level of confidence level.

Thomas P. recommends whether hospitalized or not, people who have had COVID-19 should also be evaluated at an appropriate period after initial infection to monitor and address symptoms of Long COVID conditions. Clinicians must identify the post-exertional symptom exacerbation, the adaptation of "Stop-Rest-Pace" approach, activity management or pacing being done by the patients of Long COVID [13].

Study by Jimeno-Almazán A *et al*. states that concurrent training which includes endurance and strength training is the preferable treatment for lung diseases to improve peak pulmonary oxygen uptake, systematic oxidative stress, muscle strength, muscle size, functional capacity, and quality of life [14] which supports the results of the present case report.

Physiotherapy treatment aims to improve the dyspnea, muscle strength, fatigue and quality of life. Goals of the treatment are to strengthen the muscles of respiration, improve endurance of the respiratory muscles, improve the vital capacity, improve exercise tolerance and fatigue levels. Authors suggest, exercise protocols containing Humidification, Respiratory muscle training, Incentive Spirometry, strengthening for major muscle groups, Aerobic conditioning are beneficial in managing Long COVID symptoms.

Conclusion

The case report concludes that physiotherapy interventions in the form of Aerobic training, Strength training along with respiratory muscle training are beneficial to improve the functional capacity, exercise tolerance, overall quality of life and mental wellbeing of the individual.

Future Recommendations

Authors recommend pulmonary rehabilitation in Long COVID patients to improve quality of life and promote healthy and active life style.

Abbreviations

COVID: Corona Virus Disease, CORAD: Covid -19 Reporting and Data System, CT: Computed Tomography, HRR: Heart rate reserve, MMRC: Modified Medical research council, NIV: Non- invasive ventilation, IL: Interleukin, NRBMV: Non- Re-breather bag and mask ventilation, PTSD: Post Traumatic Stress Disorder, RMT: Respiratory Muscle Training, SARS-CoV-2: Severe acute respiratory distress syndrome Corona virus -2, 6MWTD: 6-minute walk test distance.

Consent for Publication

The authors certify that they have obtained all appropriate patient consent forms. In the form, the patient has given his consent for his images and other clinical information to be reported in the journal. The patient understands that name and initial will not be published and due efforts will be made to conceal identity, but anonymity cannot be guaranteed.

Availability of Data and Material

All data generated or analyzed during this case report are included in this publish study. Other information of this case report is available from the corresponding author on reasonable request.

Funding Sources

Nil

References

1. Rajnik M, Cascella M, Cuomo A, Dulebohn SC, Di Napoli R. Features, Evaluation, and Treatment of Coronavirus (COVID-19). Uniformed Services University of The Health Sciences, 2021.
2. Raveendran AV, Jayadevan R, Sashidharan S. Long COVID: an overview. Diabetes & Metabolic Syndrome: Clinical Research & Reviews. 2021.
3. Mazza MG, De Lorenzo R, Conte C, Poletti S, Vai B, Bollettini I *et al*. Anxiety and depression in COVID-19 survivors: Role of inflammatory and clinical predictors. Brain, behavior, and immunity,2020:1:89:594-600.
4. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C *et al*. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. American journal of respiratory and critical care medicine,2013:15:188(8):e13-64.
5. Hanada M, Kasawara KT, Mathur S, Rozenberg D, Kozu R, Hassan SA *et al*. Aerobic and breathing exercises improve dyspnea, exercise capacity and quality of life in idiopathic pulmonary fibrosis patients: systematic review and meta-analysis. Journal of thoracic disease,2020:12(3):1041.
6. Scheiber B, Spiegl C, Wiederin C, Schifferegger E, Schiefermeier-Mach N. Post-COVID-19 Rehabilitation: Perception and Experience of Austrian Physiotherapists and Physiotherapy Students. International Journal of Environmental Research and Public Health,2021:18(16):8730.

7. Rajala K, Lehto JT, Sutinen E, Kautiainen H, Myllärniemi M, Saarto T. mMRC dyspnoea scale indicates impaired quality of life and increased pain in patients with idiopathic pulmonary fibrosis. ERJ open research,2017:1:3(4).
8. Skevington SM, Lotfy M, O'Connell KA. The World Health Organization's WHOQOL-BREF quality of life assessment: Psychometric properties and results of the international field trial. A report from the WHOQOL group. Qual Life Res,2004:13:299-310.
9. Durmaz B, Soysal P, Ellidokuz H, Isik AT. Validity and reliability of geriatric depression scale-15 (short form) in Turkish older adults. Northern clinics of Istanbul,2018:5(3):216.
10. Kulkarni M, Parab S. Effectiveness of respiratory muscle training along with aerobic training in community dwelling elderly individuals. International Journal of Applied Research,2016:2(4):130-4.
11. ACSM's Guidelines for Exercise Testing and Prescription. 10thedition. | Philadelphia, PA : Wolters Kluwer Health, 2018, 234.
12. ACSM's Guidelines for Exercise Testing and Prescription, 9th edition Philadelphia, PA: Wolters Kluwer Lippincott Williams & Wilkins, 2014, 173.
13. Thomas P, Baldwin C, Bissett B, Boden I, Gosselink R, Granger CL *et al*. Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations. Journal of Physiotherapy,2020:66(2):73-82.
14. Jimeno-Almazán A, Pallarés JG, Buendía-Romero Á, Martínez-Cava A, Franco-López F, Sánchez-Alcaraz Martínez BJ *et al*. Post-COVID-19 Syndrome and the Potential Benefits of Exercise. International Journal of Environmental Research and Public Health,2021:18(10):5329.