Physiotherapy in Telerehabilitation Mode Improves Health-Related Quality of Life and Functional Muscle Strength in COVID 19 Survivors: A Case Series

Karishma Daswani[1], Kavya Bhatia[2]

ReLiva Physiotherapy and Rehab Nerul, Ashirwad Apartments, F-2 Type Jagatguru Aadi Shankaracharya road, Sector-3, Nerul, Navi Mumbai, Maharashtra

Abstract

Introduction: Pulmonary rehab is effective for various chronic lung conditions. COVID-19 leads to conditions like ARDS, SARI wherein pulmonary rehab has been shown to be effective. Under the current pandemic situation, wherein access to transport and healthcare facilities have been difficult, ReLiva Physiotherapy & Rehab initiated tele-pulmonary rehab for COVID patients, known as" Respirehab". This article is to present findings of the patients who have completed the 1-month Respirehab program**.**

Objective: To determine whether respirehab delivered to COVID-19 patients has beneficial effects pre and post

1. Functional outcome measures
2. Clinical outcome measures.

Materials & Method: Respirehab is a 1-month program delivered online through real time video calls and exercise prescription through pre-recorded videos. Key components are breathing exercises and progressive physical exercises. This program starts with a detailed assessment on a video call with a physiotherapist, subsequent to which a plan of care is prepared online. Weekly reviews conducted and accordingly treatment protocols were modified, whenever required. It was ensured that at least 2 live video sessions per week were held with the patient for motivation and program safety. The patients' outcomes were measured on SGRQ, MMRC, 1 RM – 10 RM, and SPO2 data. We collected these data in the beginning of the program and at a weekly interval.

Results: Patients showed improvement on each of the scales and which was significant. The pre and post data was analysed using following outcome measures SGRQ, MMRC, 1RM-10RM, SPO2 MONITORING. The average improvement seen in the outcomes is 70%.

Conclusion: Respirehab holds a lot of assurances for patients recovering from COVID-19. In the current sample size, all patients showed improvement in clinical and functional outcomes. Findings from a larger sample will validate the benefits more conclusively.

Keywords: *COVID rehabilitation, COPD, ARDS, COVID-19, SGRQ, MMRC, TELEREHABILITATION, Respirehab.*

Introduction

Corona virus has been spreading rapidly in India and many of the COVID survivors would require rehabilitation in order to overcome respiratory and physical impairment caused by the disease. A rehabilitation protocol which is scalable, accessible, convenient and effective is the need of the hour. The most recent study on pulmonary rehabilitation and its impact on COVID-19 patients come from Hainan General Hospital, China. This

randomized controlled study investigates the effect of a respiratory rehabilitation program on respiratory function, QOL, mobility and psychological function in elderly patients with COVID-19 [4]. COVID-19 impacts patients primarily through deterioration of lung function and breathing capabilities, usually manifesting as pneumonia, SARI (Severe Acute Respiratory Illness) and ARDS (Acute Respiratory Distress Syndrome).

A large number of these patients would benefit from pulmonary rehabilitation to improve breathing and lung function. Many of us are aware about the role of physiotherapy in treating cardiovascular and pulmonary conditions but little has been found about its pivoting role in treating the symptoms of SARS-COV-2(COVID19). In more severe cases patients require aggressive respiratory care where medical specialists such as pulmonologist, intensivists, infection control, along with physiotherapist have shown better results in treating SARS-COV2 (covid-19).[1] There have been also set of preventive advisories issued by different bodies all over the world for non covid or asymptomatic patients.

Pulmonary Rehabilitation has always played a very important role in management and health maintenance of patients with acute and chronic respiratory diseases showing prolonged symptoms by improving their Quality of Life. According to recent studies fever, cough, breathlessness, fatigue and body ache are the cardinal symptoms of COVID-19 which usually last for 7-14 days. But in some cases, it is reported that breathlessness, cough and fatigue may exceed longer duration. These patients are termed as “Long Haulers”.

Pulmonary rehab being a graded exercise plan , which plays an important role in countering various aspects; such as to prevent its contagious nature of the virus; home isolation is advised on a larger scale; which results in physical degeneration at muscular level as well as it leads to negative impact on metabolic levels of an individual (most vividly seen in elderly)[6,7].Immobility triggers underlying conditions such as type 2 diabetes, hypertension, postural defects etc. which worsens the clinical condition of patients. In Indian scenarios, we are used to staying in a joint or nuclear family through most of the phases of our life; but when it comes for isolation it has been observed that a lot of patients irrespective of their age group undergo depressive or emotional instability. As a known fact, physical activity releases hormones such as dopamine and endorphins which helps to generate positivity at psychological levels and has beneficial effects at muscular level also. Earlier implementation of breathing exercises and conditioning of large muscle groups achieves reduction in hospital stay with underlying infection and admissions of the patients with mild symptoms of Covid-19. [6]

Our study aims to validate the efficacy of a telerehabilitation program, through therapeutic exercises given for respiratory symptoms, in patients affected by COVID-19. In a patient’s perspective, telerehabilitation treatment has positive experiences and better outcomes; also, additional benefit of reduction in healthcare incurred cost [13]. In this scenario, the implementation of telerehabilitation is required because of general home quarantine of covid population formed to avoid. Being from an economic perspective one of the reasons for implementing telerehabilitation in covid population are its advantages i.e. accessibility, convenience as it saves travel time and travel costs. Also, for patients it reduces exposure to other pathogens and pollution which could be present while visiting a clinic or hospital. Team of physiotherapists from ReLiva Physiotherapy & Rehab have designed Respirehab, (a telerehabilitation program); it is the personalised program delivered through online sessions (one to one) and the session lasts for approximately an hour. The flow of activities involved from admission to telerehabilitation is elaborated below in flowchart.

Materials and Methodology

Study design-

It is an analytical study design for case series to determine the pre-post intervention of functional and clinical outcome measures in population infected with COVID-19

Source of data-

Patients undergoing Respirehab program have consented for use of data for such purposes

Sample selection-

This sample is of the six patients who have undergone the Respirehab program. Patients were informed through a text message transmitted on social network (WhatsApp); they will be contacted with a general message informing of the possibility of participating in a physiotherapy study; all those interested were informed later in more detail. The consent for treatment and participation had been taken for the same. Patients with other co morbidities have more deteriorating outcomes compared with patients without. Patients with a history of uncontrolled hypertension, chronic lung disease, diabetes and other cardiovascular disease have the worst prognosis and most often end up with deteriorating outcomes such as ARDS and Pneumonia; and also there are no such physiotherapy guidelines for these patients.

Inclusion criteria-

1) Age 20 - 60 years

2) Patients having positive reports of Covid -19 and are in hospital/ home confinement.

Exclusion criteria-

1) Patients with chronic lung diseases

2) Patients with chronic kidney diseases

3) Patients affected with chronic neurological disorders

4) Patients suffering from cardiovascular conditions without medical treatment.

5) Patients who have had respiratory conditions in the last 12 months.

6) Patients who have recent musculoskeletal disorders who are not fully recovered from their injury.

7) Patients affected with chronic mental or psychological disturbances.

8) Patient classified as moderate or severe cases based on the following criteria:

- Respiratory rate >/= 30 BRPM
- SPO2 < 90%
- O2 dependency more than 8 litres

- Cardiac Rate > 125BPM
- Uncontrolled Hypo/Hypertension
- Severe dyspnoea (MMRC grade 4)
- Altered sensorium / Electrolyte imbalance

Intervention –

Protocol: Respirehab is a four weeks program and consists of therapeutic exercises like breathing technique (diaphragmatic/segmental/breath stacking), dyspnoea relieving techniques, relaxation techniques, mucus clearance techniques along with exercise regime of thoracic expansion exercises, aerobic exercises, strengthening and conditioning exercises. Before initiating the program, patients were explained about the benefits of the program and were also guided about the dos and don'ts during the program according to the infection control guidelines. In the session's patients were shared with the educational content and exercise videos copyrighted by Reliva. The outcome measures used to deliver functional and clinical outcomes were Spo2 (saturation) monitoring, 1RM-10RM, MMRC (dyspnoea scale), SGRQ (to measure functional outcome). Saturation partial oxygen (SPO2) levels have been measured i.e. pre and post on pulse oximeters just to avoid any adverse effects during the session. 1RM-10RM (RM-repetition maximum) is used to measure the strength of major muscle groups with weights/ resistance. Saint George Respiratory Questionnaire (SGRQ) is used to measure the impact score, activity score, and symptom score of underlying respiratory condition in terms of activities of daily living.

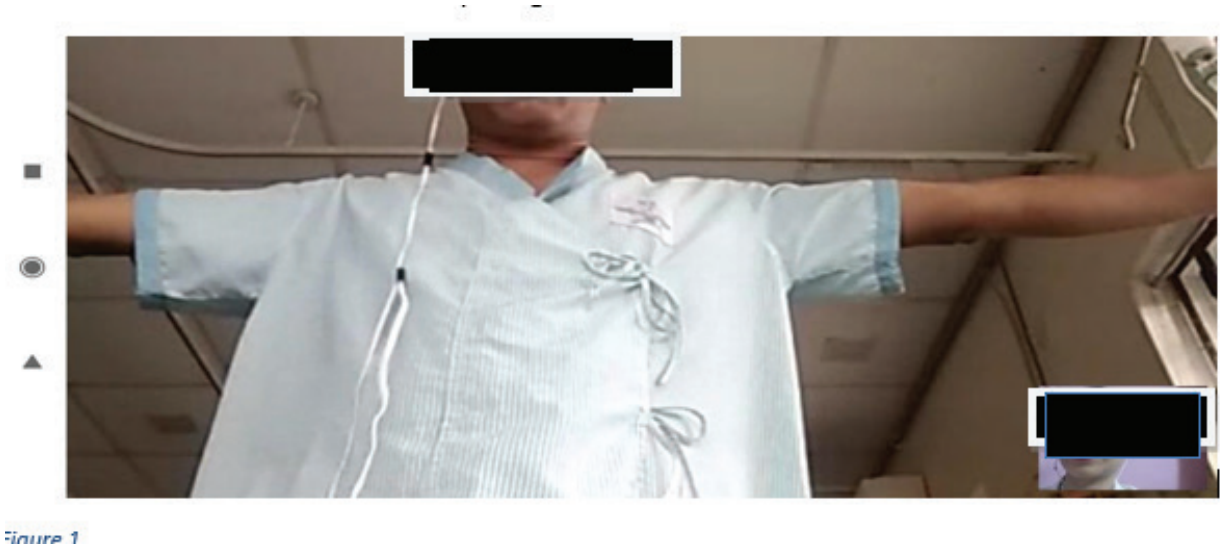


Figure 1

Figure 1

Process: Initially a patient is consented and a detailed assessment is taken during the first session with all the above-mentioned outcome measures (SGRQ/ MMRC/1RM-10RM/SPO2). Patients can combine the medical treatment with the prescription of customized therapeutic exercise programs. Exercise monitoring will be developed through telerehabilitation tools i.e. emerging technology (Microsoft teams/Zoom/ WhatsApp etc.) through which telerehabilitation care can be provided through a stay home and stay safe guidelines published by WHO. Patients are encouraged to carry out the treatment and follow up has been taken completely through video conferencing that will encourage them to improve their functional independence and quality of life. Encouragement and their personal efforts will reduce the rate of loss to follow up and drop out during the course of the entire program which extends till 4 weeks. Patients will be asked in the follow up (daily contacts) if they have carried out any other activity, if any interference in the treatment revealed will be grounds for exclusion. Similarly, all the outcome measures are re analysed on a weekly basis to mark the progress of the patient.

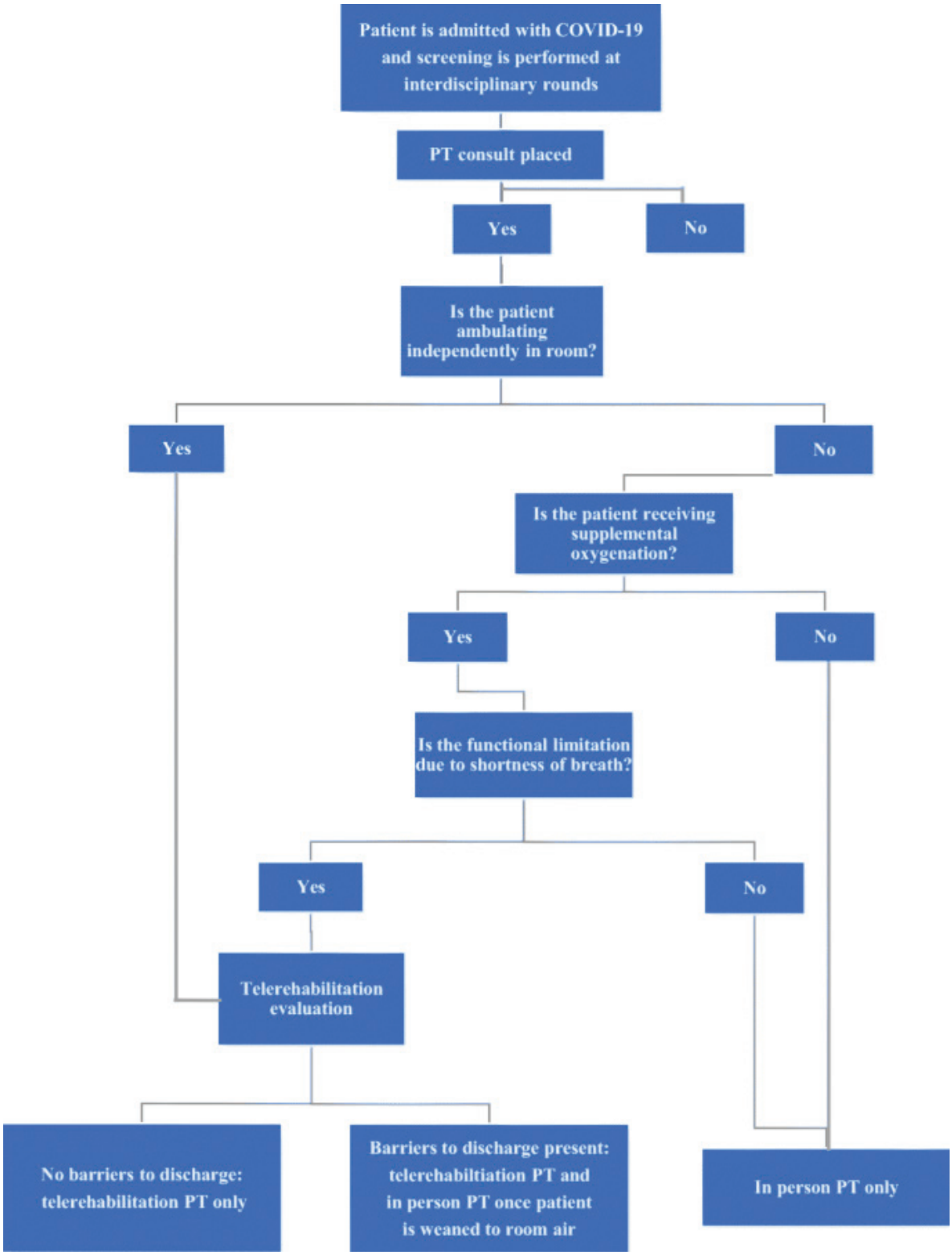
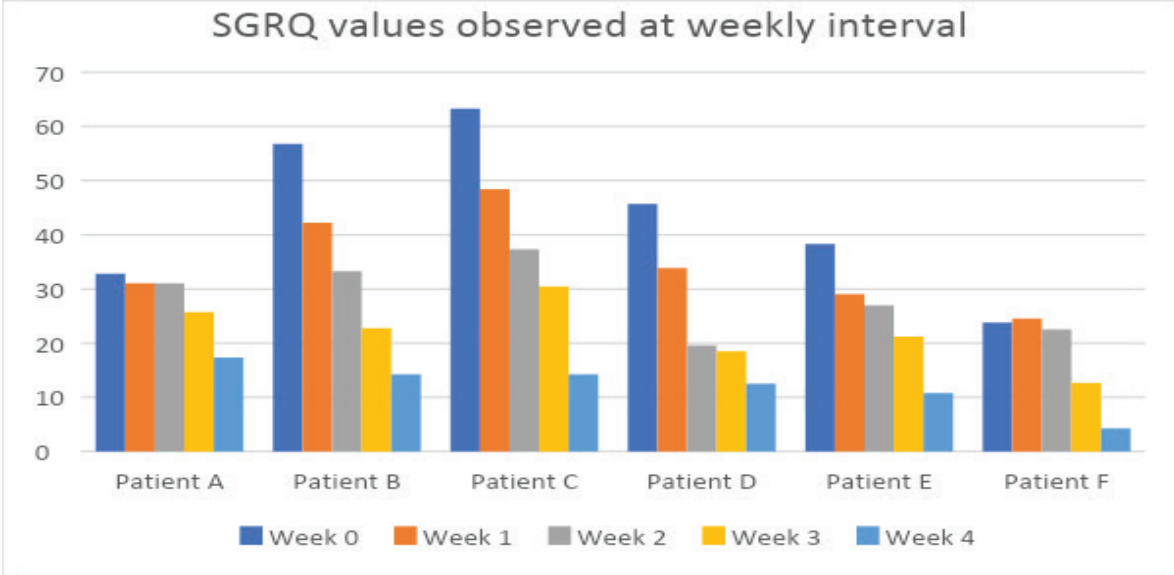

Patient is admitted with COVID-19 and screening is performed at interdisciplinary rounds
PT consult placed
Yes
No
Is the patient ambulating independently in room?
Yes
No
Is the patient receiving supplemental oxygenation?
Yes
No
Is the functional limitation due to shortness of breath?
Yes
No
Telerehabilitation evaluation
No barriers to discharge: telerehabilitation PT only
Barriers to discharge present: telerehabiltiation PT and in person PT once patient is weaned to room air
In person PT only

Figure 2



Findings: Fig 3: SGRQ measurements: Patients SGRQ scores which were calculated weekly can be observed in figure 3. All the patients showed consistent and progressive improvement in their SGRQ scores. The normal value of SGRQ scores are around 5 – 7.

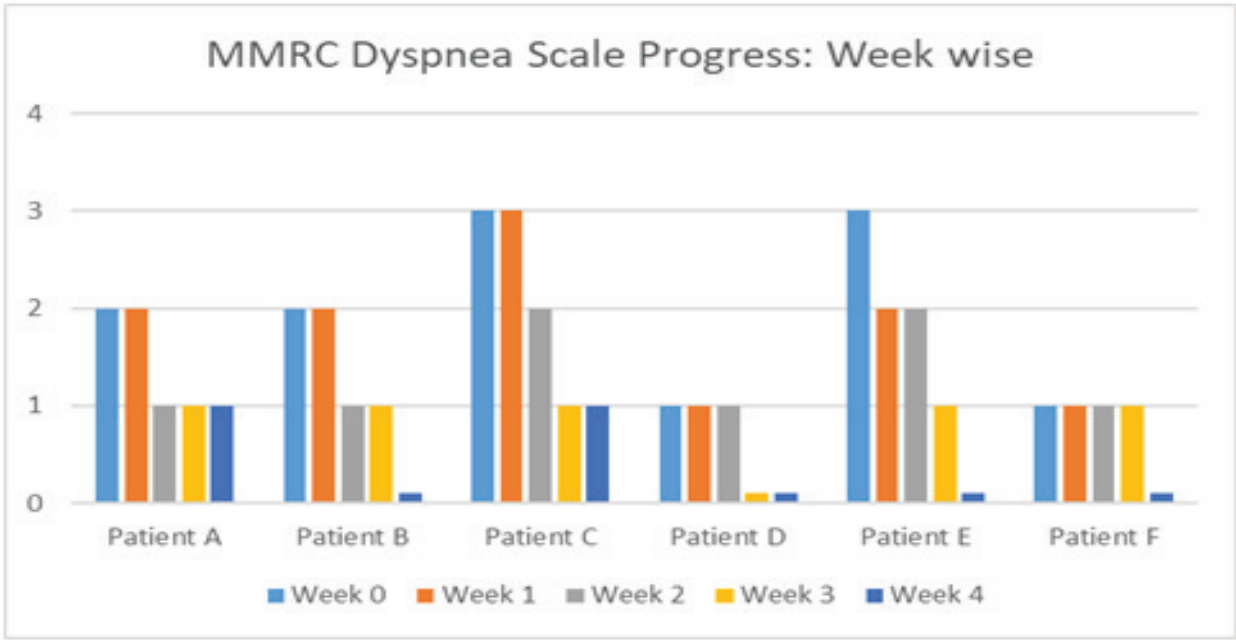


Fig.: 4 MMRC Scale: MMRC Dyspnoea scale was measured weekly. We observed improvement in MMRC Dyspnoea score of minimum 2 grades amongst all patients which is clinically significant as reflected in figure 4 below. MMRC Grade 4 dyspnoea is "too breathless to leave the house" and while Grade 0 would be "no breathlessness except on strenuous activity".

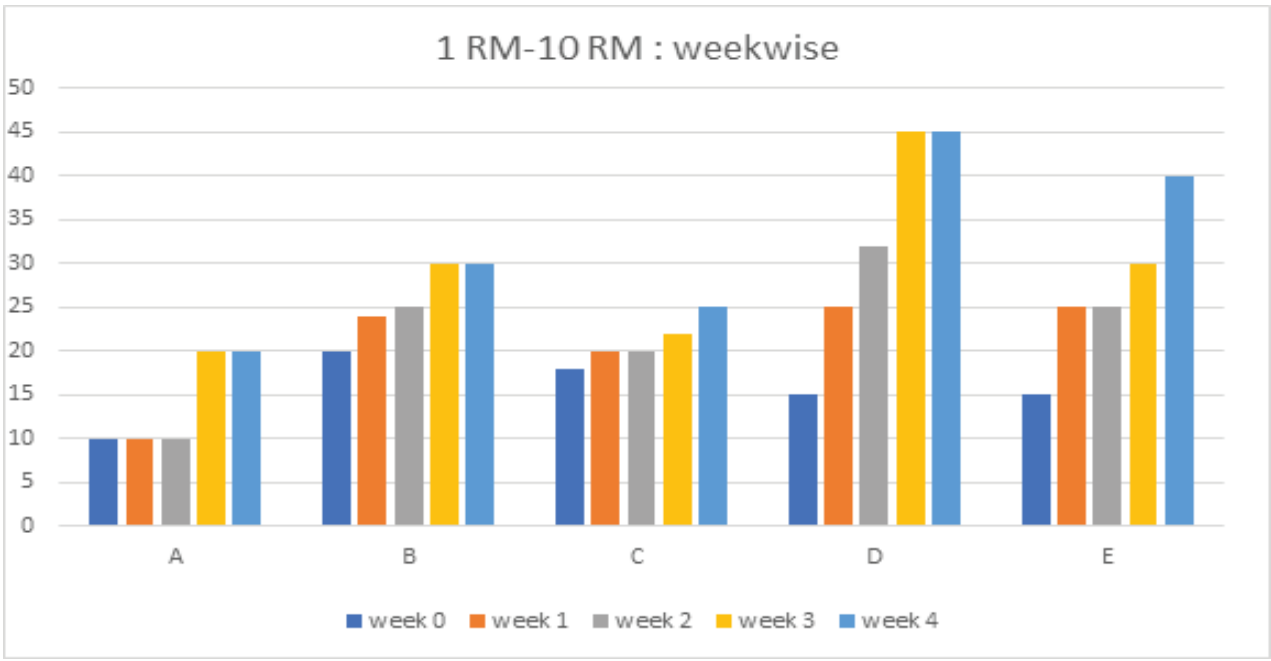


Figure 5: 1 RM – 10 RM Test: In figure 5, the graph shows an increased number of repetitions that maximum a patient could perform with 1 kg weight on a weekly basis. Whereas, the maximum repetitions are considered to be the improving strength of the patients. (Major muscle groups e.g. flexors, extensors).

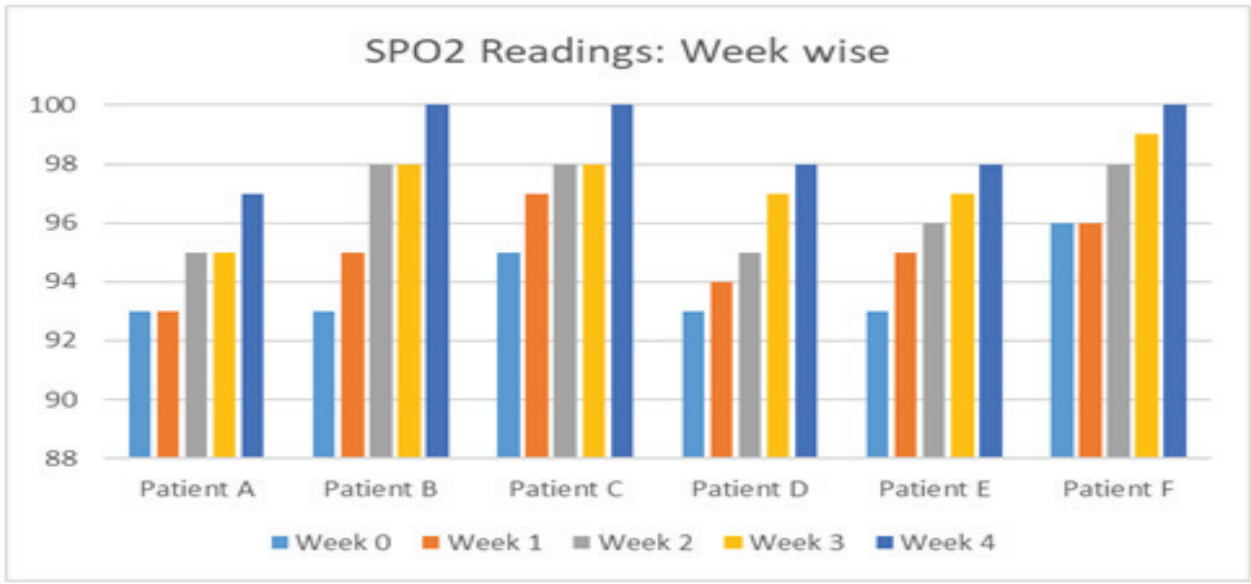


Figure 6 : SPO_2: The saturated partial oxygen levels monitored without oxygen support was measured on weekly basis, and the results are depicted in figure 6 and shows levels approaching towards normal ranges i.e. 98-100%

Results

The data indicates that patients have benefited from the Respirehab telerehabilitation program delivered extending 4 weeks; as it is an easily accessible and convenient option. Different outcome measures had different levels of achievement but most significant improvements were observed in SGRQ scores. The following results are elaborated in terms of outcome measures used and their scoring of the patients on a weekly basis.

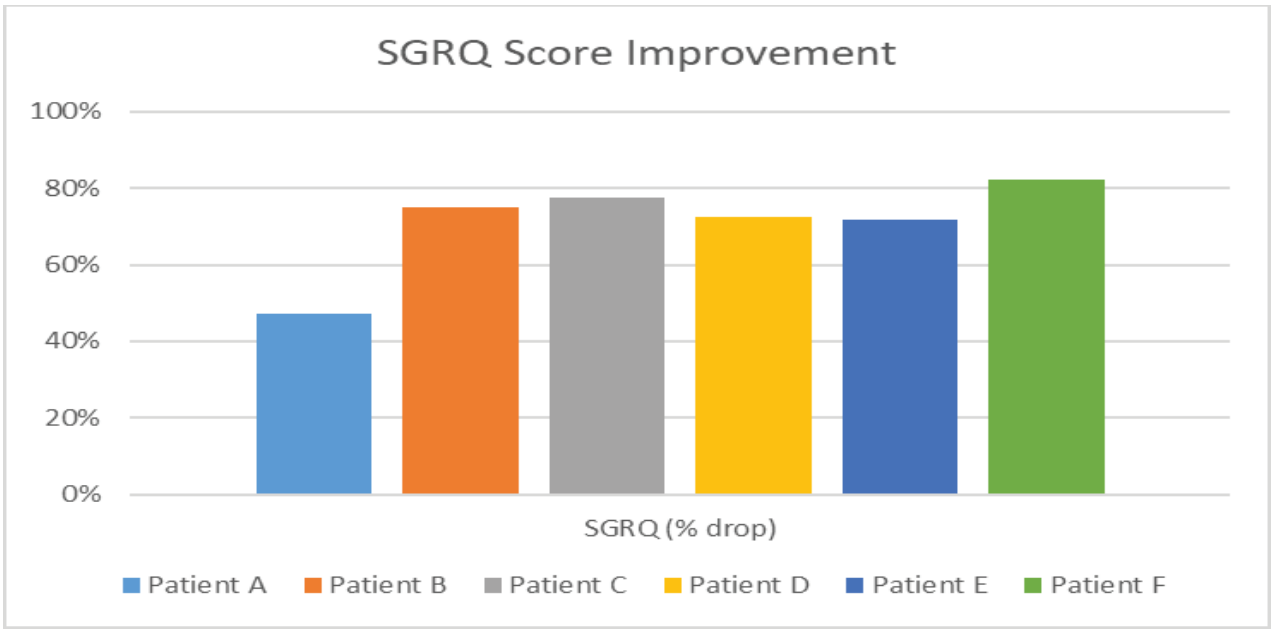


Figure 7: 1.) SGRQ- The average improvement percentage in scores of SGRQ is 71% amongst the patients

2.) MMRC- The average MMRC grade in week 0 was grade 2-3 which markedly improved with two levels down to grade 0-1 in week 4. This difference in scoring had shown reduced fatigue level and work of breathing in day to day activities of the patient.

3.) 1RM-10RM- This outcome measure was used to measure the strength of major muscle groups of upper as well as lower limbs. The ideal weight that was used for the patients was 1kg(to maintain the uniformity). Apart from patient no. 1 (who did not cross 20 reps) rest all had crossed an average of maximum repetition of 38 reps with 1kg by the end of 4th week.

4.) SPO2- saturation levels were monitored pre and post every session. Whereas, average saturation for patients in week 0 was 93-94% without O2 support; which had shown significant improvement in week 4 i.e. the average saturation of 98-100% without O2 support.

Discussion

This article presents the detailed description of the Respirehab Telerehabilitation program designed to analyse the results in terms of functional outcome (SGRQ impact score and activity score and 1RM-10RM) and clinical outcome (SGRQ symptom score, MMRC grading and saturation monitoring). The data collection is done on a weekly basis i.e. week 0 to week 4 to analyse the outcome measures. On the contrary to our expectation, we found relative changes in functional independence of activity and symptom scores in SGRQ scoring. These results suggest that Covid patients do respond uniformly to a rehab program, or to different parts of a rehab program. Patients who had slow progress in improvement of their exercise capacity during the 4-weeks of rehabilitation, may still have made significant progress pertaining to how they think and feel about their health status, daily functioning or satisfaction with life. It seems reasonable to consider both subjective and objective improvements as important outcomes; according to their SGRQ scores that are achieved are closer to the normal values than they were initially. The MMRC scores are also reduced which shows the clinical improvement linked to their independence for activities of daily living. The overall oxygen saturation (Spo2) was improved during the rehabilitation program. As observed in the entire 1RM-10RM protocol; the strength of major muscle groups (flexors, extensors) was increased.

The designed Respirehab Program which includes physical exercises, breathing techniques, dyspnoea relieving techniques, mucus relieving techniques, techniques to improve psycho-social well being is given to all patients in the same manner and delivered through telerehabilitation. The Patients were further advised

to enrol or continue the same program to achieve the normal values in the near future.

Conclusion

The current study demonstrates that along with other therapies the Respi- Care Telerehabilitation program can be given as an adjuvant therapy for the patients recovering from Covid 19. This data provides evidence that the Respirehab program helps to reduce the recovery time by reducing symptoms and improving their quality of life. Moreover, for patients this program can help them improve their lung functions and physical strength remotely; with additional benefit of reducing travel cost and time hence it is an accessible option for patients who are home quarantined, admitted in acute setup or discharged post covid recovery . It also helps respiratory therapists to treat patients without coming in direct contact with them in the current scenario of Covid 19. Findings from a larger sample will validate the benefits more conclusively.

Conflict of Interest: The authors declare that they have no financial or non-financial conflict of interest.

Source of Funding: No funding was provided to this research study.

Ethical Clearance: Participants gave informed consent before taking part

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