

Effectiveness of Chest Physiotherapy on Cardio-Respiratory Signs & Symptoms in COVID-19 Positive Patients

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ABSTRACT

Introduction: Covid-19 is considered as world pandemic disease in which patient suffers from several respiratory impairments along with weakness which affects overall body functions, thus aim of this review is to highlight role of chest physiotherapy in improving respiratory signs/symptoms of Covid-19 positive patients.

Method: The interventional study, convenient sampling with sample size of 41 subjects. Subjects of 35-80 years both male and female diagnosed with covid-19 positive were included in study. The exclusion criteria were any recent fracture, any medically diagnosed mental illness, neurological disorders and post covid-19 patients. The subjects are assessed of respiratory signs and symptoms like vital-signs, cough, dyspnea by American thoracic society grading of breathlessness, 1 minute sit to stand test, external oxygen supplement on the 1st day and again on 14th day physiotherapy administration for data analysis. The symptomatic chest physiotherapy was administered to each patient from day of reference until the discharge, 2 times in a day and 7 days/week.

Results: There was decrease in mean ATS dyspnea scoring, respiratory rate, cough and oxygen supplement and increase in mean 1 minute sit to stand repetition, oxygen saturation (spo₂) from 1st day to 14th day of physiotherapy treatment which is statistically significant comparing within groups. There was no significant difference noted in pre and post heart rate values comparing within groups.

Conclusion: The study concluded that chest physiotherapy proved to be effective in improving the respiratory signs and symptoms and overall health of covid-19 positive patients.

Keywords: Covid-19 positive, chest physiotherapy, cough, dyspnea, oxygen supplement.

INTRODUCTION

The first reports of a novel respiratory virus which was subsequently shown to be a coronavirus, severe acute respiratory syndrome Coronavirus 2 (SARS-CoV-2), emerged from Wuhan, China in December 2019. The highly transmittable virus spread rapidly and on 11 March 2020, coronavirus disease 2019 (COVID-19) was declared a global pandemic by the World Health Organisation.¹

Severe acute respiratory syndrome coronavirus 2 (SARS-CoV-2) is responsible for the coronavirus disease 2019 (COVID-

19) pandemic that has infected 10 million people and caused half a million deaths as of June 30th, 2020.²

SARS-CoV-2 is caused by a recently emerged RNA corona virus related to SARS-CoV and Middle East respiratory syndrome corona virus (MERS-CoV). Symptoms of SARS-CoV-2 infection are also similar to the other corona viruses. Although cases have been described at all ages, the virus is more likely to lead to severe interstitial pneumonia in high-risk individuals, such as the elderly and those with co-morbidities such as cancer.

The most common symptoms include fever (89%), cough (68%), fatigue (38%), sputum production (34%), and shortness of breath (19%).

People with mild COVID-19 might experience cough, sore throat, high temperature, diarrhea, headache, muscle or joint pain, fatigue, and loss of sense of smell and taste. Symptoms of COVID-19 pneumonia include breathlessness, loss of appetite, confusion, pain or pressure in the chest, and high temperature (above 38 °C).

Radiologists had to conclude their report according to two options: either CT findings highly suggestive of COVID-19 pneumonia, or inconsistent with this diagnosis. The severity of COVID-19 pneumonia was graded by the expert radiologist according to the extent of ground glass opacities and consolidation on lung window CT images, as follows: minimal (less than 10 % of lung parenchyma), moderate (10–25 %), intermediate (25–50 %), severe (50–75 %), critical (50–75 %).³

We define dyspnea as “a subjective experience of breathing discomfort that consists of qualitatively distinct sensations that vary in intensity,” as was suggested in the 1999 ATS consensus statement.⁴ The American thoracic society dyspnea scale has 5 score (zero to 4), where 0 means no shortness of breath and 4 is very severe or too breathlessness.

The 1-minute sit-to-stand (STS) test could be valuable to assess the level of exercise tolerance in chronic obstructive pulmonary disease (COPD).⁵ This test has found to have minimal importance difference as compared to other, thus can be used to find the effectiveness of pulmonary rehabilitation.

The Chest physiotherapy has proven to be effective in critically ill patient of ICU but evidence of chest physiotherapy for covid-19 positive is lacking also Covid-19 primarily affects the cardio respiratory system which eventually leads to alteration in vital signs, oxygen saturation, cardio-respiratory fitness and overall body function, thus there is need to observe the

effectiveness of chest physiotherapy on cardio-respiratory signs and symptoms of covid-19 patients

Thus the aim of the study is to highlight the effectiveness of physiotherapy treatment on Cardio-Respiratory signs & symptoms of COVID-19 positive patient.

The objective of this study is to assess cardio respiratory signs and symptoms of Covid-19 positive patients at the beginning and after 14 days of physiotherapy and to assess Cardiopulmonary Fitness by 1minute Sit to Stand test of Covid-19 positive patients at the beginning and after at 14 days of physiotherapy treatment.

MATERIALS AND METHODS

The research design was Experimental study. Convenient sampling was done. Total 41 subjects were recruited according to inclusion and exclusion criteria. The inclusion criteria for this study were Covid-19 positive patients admitted in General Hospital Ahmedabad from day of physiotherapy reference ,Both male and female of Age (35- 80 years)and Oriented patients. The exclusion criteria were, Post-Covid patients any recent fracture, any medically diagnosed mental illness and any neurological disorders

The subjects/ covid19 patients falling in inclusion criteria on the day of physiotherapy reference are selected. The oral consent from the subjects participating in the study is taken before conducting the study.

Materials used were American thoracic society grade of breathlessness, Pulse oximeter; Vital signs monitor; Chair/ bed; Pillows; Stop watch; Pen; Paper.

Data Collection:

The patient is assessed for cardio respiratory signs and symptoms:

Vital signs, SPO2, Fio2 (if ventilated), cough, breathing pattern

ATS scoring is done for dyspnea/ breathlessness

1 minute sit to stand test is performed for checking exercise tolerance (cardiopulmonary fitness)

Procedure:

After assessing the patient's cardiopulmonary signs and symptoms, symptomatic chest physiotherapy is administered in patient's protocol

On the last day of physiotherapy treatment or at time of discharge the patient is reassessed for the signs and symptoms.

A. VITAL SIGNS:

- [1] Heart Rate
- [2] Respiratory Rate
- [3] SpO₂ (oxygen saturation)

These vital signs are assessed and documented before and after completion of each day physiotherapy treatment, also on 1st day and 14th day of treatment the difference is noted

B. COUGH:

The following characteristics of the cough/sputum are assessed before and after 14 days of completion of physiotherapy treatment.

- [1] **Type:** Productive Or Dry
- [2] **Color:** White, Reddish, Brown, Yellowish, Greenish, Pale

The presence or absence of cough at time of assessing on 1st and 14th day of physiotherapy treatment is noted.

C. O₂ SUPPLEMENT/FiO₂:

The mode and amount of oxygen required by the patient to maintain the saturation externally should be noted at day of reference and again on 14th day of physiotherapy treatment.

Following are the source of O₂ supply:

- [1] High flow nasal cannula
- [2] Nasal cannula
- [3] O₂ mask
- [4] Non re breather mask(NRBM)
- [5] Ventilator (Invasive /Non Invasive)
- [6] Room air

D. DYSPNEA/BREATHLESSNESS:

Grade	Degree	Description
0	None	Not troubled with breathlessness except with strenuous exercise.
1	Slight	Troubled by shortness of breath when hurrying on level ground or walking up a slight hill.
2	Moderate	Walks slower than people of the same age on level ground because of breathlessness or has to stop for breath when walking at own pace on level ground.
3	Severe	Stops for breath after walking approximately 100 yards or after a few minutes on level ground.
4	Very Severe	Too breathless to leave the house or breathless when dressing and undressing.

E. CARDIOPULMOARY FITNESS:

1 minute sit to stand test will be used for assessing cardiopulmonary fitness of the patient.

The number of repetition of sit to stand completed by patient in 1 minute is evaluated on the day of reference while assessing and then again on 14th day of the treatment.

PHYSIOTHERAPY INTERVENTION:

After assessing the patient on the day of reference the symptomatic physiotherapy treatment is administered in patient's protocol.

The following intervention is given to patient:

- [1] Diaphragmatic Breathing Exercise
- [2] Segmental Expansion Exercise
- [3] Purse-lip Breathing Exercise
- [4] Chest PNF(Basal Lift Or Scooping)
- [5] Chest Expansion Exercise
- [6] Active Cycle Of Breathing Technique
- [7] Dyspnea Relieving Position
- [8] Prone Positioning
- [9] Limb Exercise
- [10] Functional Exercise

The physiotherapy treatment is given 2times/day for whole week (7days of week) and continues until the patient discharges.

STATISTICAL ANALYSIS

The statistical is done using SPSS version16 by keep the level of significance $p < 0.05$.

The NON PARAMETRIC (WILCOXON TEST) was used for comparing the pre and post values of ATS dyspnea score, 1 minute sit to stand repetition, vital signs, cough and O₂ supplementation.

RESULTS

A total 41 subjects were included in the study with mean age of 35 to 80 years. According to results obtained, there was significant improvement in pre and post values of ATS dyspnea scoring, 1 minute sit to stand repetition, O₂ supplement, cough and vitals (respiratory rate and SPO₂) comparing within groups.

There was no significance noted in pre and post heart rate values comparing within groups.

The data are shown in table1.

Table.1: mean and SD of outcome measures along with p value and significance.

Sr.No	VARIABLES	Pre MEAN ±SD	POST MEAN± SD	P VALUE	SIGNIFICANCE
1.	HR	83.0488± 13.81657	83.2195± 10.64549	0.716	INSIGNIFICANT
2	RR	21.6341± 5.41644	17.6585± 3.95354	0.000	HIGHLY SIGNIFICANT
3.	SPO ₂	94.5366± 2.65610	97.4634± 1.53456	0.000	HIGHLY SIGNIFICANT
4.	COUGH	0.8780± 0.33129	0.2195± 0.41906	0.000	HIGHLY SIGNIFICANT
5.	O ₂ SUPPLEMENT	0.6098± 0.49386	0.1951± 0.40122	0.000	HIGHLY SIGNIFICANT
6.	ATS SCORE	2.0732± 1.48980	0.7317± 0.94933	0.000	HIGHLY SIGNIFICANT
7.	1Minute Sit to Stand	11.92688±6.70593	17.1220±7.68178	0.000	HIGHLY SIGNIFICANT

DISCUSSION

Covid 19 positive is considered as world pandemic diseases in which patient suffers from several respiratory impairments along with weakness and psychosocial issues.

Most of the patients who are Covid 19 positive need an external oxygen supplement as per their lung involvement which affects the overall health of the patients.

In the present study physiotherapy intervention was given to the Covid 19 positive patient which had great impact in improving their overall health. The 41 patients were included in the interventional study and prior assessment of the respiratory impairment and symptomatic treatment was administered for each patient. After 14 days assessment was done again. According to the result obtained from statistical analysis significant improvement of overall health and respiratory impairment was noted.

A similar study was done by **Mirian Akemi Onoue et al.**⁶ On Physiotherapy Care of Patients with Corona virus Disease 2019 (COVID-19) suggested that

Physiotherapy plays a fundamental role throughout patient hospitalization. However, the hospital physiotherapy team must be well-oriented regarding specific care to both reduce infection risk and provide the best patient care.

A another study by **Peter Thomas et al.**⁷ conducted on Physiotherapy management for COVID-19 in the acute hospital setting which includes: recommendations for physiotherapy workforce planning and preparation; a screening tool for determining requirement for physiotherapy; and recommendations for the selection of physiotherapy treatments and personal protective equipment which forms the basis of the present study.

Sheral T Kachpile et al.⁸ conducted study on Physiotherapy Interventions in COVID-19 Patient with Multiple Co-morbidities: A Case Report and concluded that In-hospital Pulmonary rehabilitation in acute and sub-acute phase which involved patient education, respiratory care, exercise training, walking program with supplementary oxygen, energy conservation and psychological

support played an important role in this patient in his course from ICU to discharge by assisting in weaning of supplementary oxygen, improving lung and functional capacity and thus facilitating recovery while the present study was done on multiples subjects (41) and effect was seen in resolving respiratory symptoms of covid-19 by giving the chest physiotherapy .

The chest physiotherapy techniques and the protocol administered to patient also plays the major role for improving the patient overall health. **the Happiness Anulika AWETO1 et al.** ⁹ Conducted the study on the roles of chest physiotherapy in the management of patients with covid-19 and concluded that The clinical manifestations of COVID-19 which are largely respiratory have solutions rooted in very many of the techniques that Cardiopulmonary physiotherapists use in managing respiratory conditions. Therefore, chest physiotherapy is an important adjunct therapy in the management of patients with COVID-19 which is similarly shown in present study.

The chest physiotherapy for weaning from mechanical ventilation was investigated by **Denise Battaglini et.al.** ¹⁰ The findings suggested that chest physiotherapy is an important adjuvant for weaning and improving the condition of critically ill mechanically ventilated patient with Covid-19.

William G. B. Graham et.al. ¹¹ Conducted the study on Efficacy of Chest Physiotherapy and Intermittent Positive-Pressure Breathing in the Resolution of Pneumonia and concluded that Chest physiotherapy and intermittent positive-pressure breathing do not hasten the resolution of pneumonia.

Limitations of the present study are that this study could be performed on large number of population. The subjects taken for study were taken from only one hospital of Ahmedabad.

The future research can be done on physiotherapy role in sequels of covid-19 like covid-19 pneumonitis. The studies can

be done which may include subjects with different co-morbidities along with covid-19 to observe the effect of physiotherapy treatment on different groups.

CONCLUSION

Based on the results obtained from this study, chest physiotherapy proved to be effective in improving the respiratory signs and symptoms and improving overall health of covid-19 positive patients.

The breathlessness score, respiratory rate, o₂ supplement and cough are shown to be significantly decreased while oxygen saturation increases significantly thus improving the patient's health after the physiotherapy intervention.

Hence the experimental hypothesis is accepted and null hypothesis is rejected. So it should be included as integral part of treatment given to covid-19 positive patients.

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