

EFFICACY OF PURSED LIP BREATHING WITH BHASTRIKA PRANAYAMA VS INCENTIVE SPIROMETRY IN REHABILITATING POST COVID 19 FOLLOW UP-A RANDOMIZED CONTROL STUDY

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ABSTRACT

Background

Covid 19 infection has severe impact in various systems of the body, but primarily it affects the respiratory system by destroying the lung tissues, and thus leading to an acute medical emergency. There is an alarming sign to be noted, on the raise of post covid patient's numbers, who arrive at post covid follow up special clinic with persistent breathing difficulty. Hence this study focuses on post hospitalization pulmonary rehabilitation with an effective home exercise to improve the pulmonary ventilation.

Aim

This study aims to explore the efficacy of combining various breathing exercise to improve the pulmonary ventilation.

Methods

An Experimental study was carried out with 48 participants. On the basis of inclusion and exclusion criteria, all of these participants were categorized into experimental and control group. Experimental group received pursed lip breathing exercise with bhasrika pranayama and the control group received Incentive spirometry. The FVC & FEV1 parameters in PFT were recorded pre and post to the intervention by blinded tester who was not aware about group allotment.

Result:

Post test FEV1 experimental group shows a mean value of 75.75 and standard deviation of 3.7997 and showing a T value of 5.2756 with a p value of <0.0001. Post test FEV1 shows significant improvement among both groups.

Conclusion

The present study analyzed efficacy of intervention for patients with dyspnea in post covid follow up clinic. The patients are not only having respiratory complaints but also had complaints of various dysfunctions. So the other factors should also need to be assessed and a proper intervention should be rendered in order to prevent re-hospitalization.

Keywords:

Pursed lip breathing, Bhastrika pranayama, Incentive spirometry, FVC, FEV1.

I. INTRODUCTION

A previously unknown virus, now known as the 2019 novel corona virus, which originated from Wuhan, China, in December 2019, caused a massive spread across China, and also become a pandemic worldwide by spreading initially in Thailand, the Republic of Korea, Japan, the United States, the Philippines, Vietnam, and in India. On February 11, 2020 WHO officially named the disease Corona virus disease 2019.¹ The outbreak of this disease has killed at least 9 lakh people worldwide, affecting over 3.1 crore people. Individuals who contracted the virus were hospitalized, and some died as a direct result of lung complications such as acute respiratory distress syndrome and respiratory failure.²

In India till Jan 3rd 2021 the number of overall confirmed positive cases were 1,99,35,471 and specifically in southern part of India, there were 12,07,112 confirmed positive cases of Covid 19 infection and out of these cases approximately 14,346 deaths were recorded in Tamilnadu alone.³ Covid19 infection primarily triggered lung infections mostly in the form of viral pneumonia. Severe infections exacerbated hypoxemic pulmonary failure with characteristics of the acute respiratory distress syndrome.⁴

Few researchers suggest that patient experiences hypoxemia which occurs due to dyspnea. In addition the research also identified the key role in this process is the thatshunt physiology, which is associated with serious anomalies in ventilation-perfusion (V/Q) as well as abnormal hypoxic vasoconstriction.⁵

The clinical symptoms of the condition were classified according to their intensity. Mild disease considered as non-pneumonia and mild pneumonia. The manifestation of dyspnea, respiratory frequency ≥ 30 /min, and blood oxygen saturation (SpO₂) $\leq 93\%$, PaO₂/FiO₂ ratio was considered as the severe disease. Chronic cough, chest tightness and shortness of breath, with or without fever, are common respiratory symptoms. However, in the event of Severe Pneumonia, extreme dyspnea with respiratory distress, tachypnea (> 30 breaths/min), and hypoxia (SpO₂ $< 90\%$ on room air) and a high grade fever and body ache is noted. The symptomatic treatment along with O₂ therapy is the first line of available treatment in respiratory dysfunction. Non-invasive (NIV) and invasive mechanical ventilation (IMV) would be administered to the patient if oxygen therapy fails to keep the patient stable.⁶

The diagnosis is done by various methods such as RT-PCR and radiographic observations. The radiological features of Covid 19 reveal normal lung parenchyma with ground-glass opacities, focal consolidations, and abnormalities of pulmonary vascular perfusion.⁷ Diffuse alveolar damage (DAD) with hyaline membrane formation, pneumocyte activation, microvascular thrombi, lymphocytic inflammation, and proteinaceous edema are noted in the microscopic studies, which reveals the intensity of the damage to the lungs.^{8,9} Co morbid patients with chronic illnesses such as coronary disease or COPD were at a higher risk of developing more serious symptoms due to COVID-19 infection.¹⁰

Few studies advocated cardio respiratory physiotherapy may be beneficial in the respiratory treatment and physical rehabilitation of patients with COVID-19. The patients were referred to have physiotherapy intervention, when they struggled to breathe, inability to cough out the secretions, suffered with severe lung congestion and with an evidence of pneumonia on imaging. Various Airway clearance therapies were administered to the patients, which includes different types of breathing exercises, positioning, active cycle of breathing technique including coughing and huffing.¹¹ Few studies suggested that combination of Breathing exercises and various type of pranayamas also showed much beneficial results to increase the pulmonary ventilation in various pulmonary conditions.^{12,13,14} So the objective of the study was to identify and deliver an efficient combination of various therapeutic approaches to improve pulmonary ventilation in post covid 19 follow up patients.

II. MATERIALS & METHODS

An experimental study design was framed. Total of 56 participants, who were willing to participate in the study, were recruited from Saveetha medical college & Hospital, Chennai. On the basis of selection criteria, 8 participants were excluded and 48 participants were selected. The participants were informed about the intent of the study and treatment procedures were explained to the participants and received informed consent and information sheet from them. The study was approved by institutional review board.

Patients who came to post covid follow up clinic were referred to physiotherapy OPD and the patients with both genders, aged from 18-60 were included in the study. Patients with Post covid-19 CVA, Renal failure & MI were excluded from this study. Participants of the study were randomly allotted by lottery method in to two groups as experimental group and control group with 24 participants equally distributed in each group. The experimental group received Pursed lip breathing along with Bhastrika Pranayama. Control group received Incentive spirometry.

III. RANDOMIZATION AND BLINDING

The selected participants were randomized to undergo either “Combination of pursed lip breathing exercise with Bhastrika Pranayama or Incentive spirometry”. Both the groups were balanced throughout the study with equal sample size. Pre-test and post-test FVC & FEV1 (PFT) values were recorded by a trained physiotherapist who was blinded about the group allotment & its treatment procedure.

IV. PROCEDURE

The experimental group participants were instructed to inhale through nose, keeping the mouth closed while breathing normally. The subject was asked to purse the lips. The mouth was kept slightly opened as if going to whistle. Head kept in a neutral position while keeping the shoulders relaxed. Patient was then asked to exhale through the pursed lips and was asked to count upto four or five while exhaling, keeping in mind that the exhalation should be twice as long as the inspiration. Patient was also informed that, the purpose of the exercises to slow breathing down and exhaled trapped air out of the lungs. Followed by the Pursed lip breathing Bhastrika pranayama was done in sitting posture and the following instructions was given to the subject: (i) Sit in a meditative pose or in a comfortable position on the floor, (ii) The back must be kept straight and shoulder muscles should be kept relaxed, (iii) Subject was asked to close the right nostril with right thumb and to bring right elbow to the level of right shoulder, (iv) To close the eyes, inhale and exhale through left nostril-first slowly, then a little faster, (v) The subject was asked to do the above steps about 20-25 times, (vi) Then the subject was asked to take a long breath in and retain it for as long as possible, (vii) This is one cycle of Bhastrika pranayama. The subject has to repeat this cycle by closing left nostril and breathing through right nostril. Both the pursed lip breathing and the Bhastrika pranayama was asked to be done as a home exercise daily for 5 min thrice a day over a period of 6 weeks.

The control group participants were asked to do breathing exercise with incentive spirometry. The subject is asked to create a tight seal around the mouthpiece and asked to inhale deeply and slowly and the subject would observe the flow meter for visual feed back of his effort. At the end of the inspiration the subject is asked to sustain the inhalation 2-3 seconds to facilitate the Inspiratory hold. Subject relaxes the seal around the mouthpiece and exhales. Normal breathing is taken, then the exhalation phase in the incentive spirometry is done and the whole cycle is repeated 5-10 times thrice a day over a period 6 weeks as a home exercise.

V. OUTCOME MEASURES

The Pulmonary Function Testing with the FVC & FEV1 was used as an outcome evaluation. The data were recorded and tabulated Pre-treatment 1st week and Post treatment 6th week for both the groups by one of the co-author who is blinded for group allotment.

VI. RESULT

The collected data was tabulated and analyzed using descriptive and inferential statistics. To the parameter used mean and standard deviation (SD) was calculated. Paired t-test was used to analyze the significant changes between pre-test and post-test measurements. Unpaired t-test was used to analyze significant changes between two groups significance level of ($p < 0.0001$) was considered statistically significant. The data from the Table 1 shows between group analysis at baseline and Table 2 shows with in group analysis for MABP of the Group-A and Group B Subjects.

Table 1 shows the pre-test mean 65.875 and standard deviation 5.1906 and post mean, post standard deviation are 70.5 & 5.5302 with the t value of 5.294. Values of experimental Group FVC and in control group FVC pre mean and pre standard deviation are 67.0417 and 5.1839, post mean, post standard deviation as 69.4167 & 5.8089 with the T value of 5.3472 with p value <0.001. This shows there was homogenous distribution of subjects between two groups at baseline.

Table 1 shows experimental group FEV1 Pre mean and pre standard deviation as 60.0417 and 5.6086, post mean, post standard deviation as 75.75 and 3.7997 with the T value of 10.5832. Control group FEV1 pre mean and pre standard deviation is 63.5833 and 7.2452, post mean, post standard deviation are 67.0417 & 7.1384 with the T value of 6.4044.

Table 2 shows the experimental pre test FVC mean as 65.875 and standard deviation as 5.1906, T value of 0.7791 and p value 0.4708.

Pre test FEV1 experimental group shows a mean value of 60.0417 and standard deviation of 5.6086 showing a T value of 1.8937. With a p value of 0.2627. Post test FVC experimental mean value 70.5 and standard deviation of 5.5302 T value 0.6617 and p value 0.5559. Post test FEV1 experimental group shows a mean value of 75.75 and standard deviation of 3.7997 and showing a T value of 5.2756. With a p value of <0.0001. Post test FEV1 shows significant improvement among all the group.

VII. DISCUSSION

It was observed that the impact of Covid 19 infection had a major role in affecting the quality of life of the person even after the acute severe phase of the infection. Many patients were reporting to the Covid 19 follow up clinic with the symptoms of dyspnea, even while putting a minimal level of exertion and some even complained that, they were not able to get back to their normal life due to persistent breathlessness even during a small bouts of ADL this is further supported by Garrigues.^{15,16} It has to be taken into consideration that, 27 percent of patients discharged post covid 19 infection were readmitted and even few patients expired by 2 months after discharge.¹⁷ Another literature review reveals that, the multi organ failure rate was high in the Covid 19 post hospitalization patients, when compared to general population.¹⁸

Few authors concluded in their study that, post hospitalization after three months majority of the patients CT Chest revealed the multi opacity areas and it indicated that there are less diffusion capacities in those areas, hence it was a major cause for readmission to the hospital with severe dyspnea and impaired lung function.¹⁹ Our group has conducted research relevant to physiotherapeutic intervention on various neurological and musculoskeletal ailments²⁰⁻²⁷, and warrants further experimental research by our group in signifying the results. It was put forwarded that, in order to restore a healthy quality of life among post covid 19 contracted patients, it is necessary to promote healthcare support in order to assist them in regaining physical and pulmonary function as well as minimizing depression and anxiety, especially for patients with co morbidities and those who live alone in rural locations.

Hence this current study was focused in rehabilitating the post covid 19 patients to avoid attacks of dyspnea, which may force them to get readmitted in to the hospital for a life saving situation. It also focused on identifying the best method to achieve good pulmonary ventilation in order restore the effective functioning of the lungs.

VIII. CONCLUSION

The present study analyzed efficacy of intervention for patients with dyspnea in post covid follow up clinic. The patients are not only having respiratory complaints but also had complaints of various dysfunctions. So the other factors should also need to be assessed and a proper intervention should be rendered in order to prevent re-hospitalization.

CONFLICT OF INTEREST: NIL

FUNDING: NIL

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Table 1: Within group analysis of FVC and FEV1 for pre and posttest values of Experimental group and Control Group

Groups	Pre Mean	Pre Standard Deviation	Post Mean	Post Standard Deviation	t value	p value
Experimental Group - FVC	65.875	5.1906	70.5	5.5302	5.294	<.0001
Control Group - FVC	67.0417	5.1839	69.4167	5.8089	5.3472	<.0001
Experimental Group - FEV1	60.0417	5.6086	75.75	3.7997	10.5832	<.0001
Control Group – FEV1	63.5833	7.2452	67.0417	7.1384	6.4044	<.0001

Table 2: Between group analysis of FVC and FEV1 for Experimental group and Control Group before and after intervention

Groups		Mean	Standard Deviation	t value	p value
Pre test FVC	Exp.g.	65.875	5.1906	0.7791	0.4708
	Control.g.	67.0417	5.1839		
Pre test FEV1	Exp.g.	60.0417	5.6086	1.8937	0.2627
	Control.g.	63.5833	7.2452		
Post test FVC	Exp.g.	70.5	5.5302	0.6617	0.5559
	Control.g.	69.4167	5.8089		
Post test FEV1	Exp.g.	75.75	3.7997	5.2756	<.0001
	Control.g.	67.0417	7.1384		