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RESEARCH ARTICLE

EFFECT OF CHEST MOBILITY EXERCISES ON RATE OF PERCEIVED EXERTION AND FUNCTIONAL CAPACITY IN COPD PATIENTS

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disorder (COPD), a prevalent condition marked by enduring respiratory symptoms and airflow restrictions. Obstructions prevent the flow of expiratory air, which results in air being trapped causing hyperinflation. Since hyperinflation restricts the range of motion of the muscles, which leads to fatigue and stiffness, it raises stress in the respiratory muscles. Chest mobilization exercises are any exercises that combine active movements of the trunk or extremities with deep breathing. They are designed to maintain or improve mobility of the chest wall, trunk, and shoulder girdles when it affects ventilation or postural alignment. However, till date, the relationship between chest mobility and functional capacity remains unknown for COPD patients. Therefore this study focus on the effect of Chest mobility exercises on functional capacity and Rate of perceived exertion in COPD patients. **Objective-**To examine the effect of chest mobility exercises on RPE and functional capacity in COPD patients. **Method:** The study design was Pre and Post-test experimental study which consists of 40 participants with COPD was selected by convenient sampling. Chest mobility exercises were given for 1 week. Outcome Measures were six minute walk test and Modified Borg scale. **Result:** Pre-Intervention Value of 6MWD was 309.18±50.36 meters and Post Intervention 6MWD was 314.15±50.74 meters which shows significant improvement in 6MWD with p-value <0.0001. Pre-intervention Value of the Modified Borg scale was 4.22±1.52 and post-intervention was 3.22±1.59.this shows significant improvement in the rate of perceived exertion with p value <0.0001. **Conclusion:** This study concluded that chest mobility exercises improve 6MWD and the rate of perceived exertion in COPD patients.

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INTRODUCTION

In the modern world, chronic obstructive pulmonary disease (COPD) is a leading cause of illness and mortality. The World Health Organization estimates that 65 million individuals worldwide have moderate to severe COPD, and that 90% of COPD-related mortality take place in developing nations. According to projections, the deaths resulting from COPD could rise by 30% over the next ten years, ranking third among all causes of mortality globally by 2030. According to studies, the overall prevalence of COPD in India is 3.49%, with regional variations.⁴ This illness is characterized by pathological alterations in the respiratory system that lead to coughing and dyspnea. Decreasing exercise tolerance is a result of the reduction in lung capacity and dyspnea that comes with COPD. Muscle dysfunction is caused by airflow obstruction. About 20–30% of people have muscle weakness on average.²

Obstructions prevent the flow of expiratory air, which results in air being trapped causing hyperinflation. Since hyperinflation restricts the range of motion of the muscles, which leads to fatigue and stiffness, it raises stress in the respiratory muscles.⁵ Patients with severe COPD experience paradoxical breathing patterns, which are typical of diaphragm dysfunction, as a result of the mechanical efficiency of the respiratory muscles, which results in decreased rib cage motion and increased belly motion. In order to fulfill the body's increased metabolic demands, the respiratory muscles are supposed to work continuously throughout life.³ During the inspiratory phase of breathing; the contraction of these muscles raises the shoulder girdle and increases the vertical motion of the rib cage. The soft tissues and muscles that surround the chest wall retract, preventing the chest from expanding.¹ Chest mobilization exercises are any exercises that combine active movements of the trunk or extremities with deep breathing.

They are designed to maintain or improve mobility of the chest wall, trunk, and shoulder girdles when it affects ventilation or postural alignment. Chest mobilization exercises also are used to reinforce or emphasize the depth of inspiration or controlled expiration.¹⁸ The chest wall, trunk, shoulders, increased ventilation on that side of the chest, emphasized depth of inspiration, and controlled expiration can all be improved with chest mobility exercises.¹⁸ Therefore the present study is to evaluate the effects of the chest mobilization technique on Rate of perceived exertion, and functional capacity by giving patient chest mobility exercises.

MATERIALS AND METHODS

Study design: A pre and post experimental study was conducted in Pravara Institute of Medical Sciences.

Study Setting: Study was conducted in, Inpatient department of Dr Vitthalrao Vikhe Patil Rural Medical Hospital, Loni.

Study Duration: August 2023 to January 2024

Sample Size and Method: A total of 40 participants were selected by simple random sampling method.

Participants: Chronic Obstructive Pulmonary Disease patients aged 45-75, male and female.

Selection Criteria: The Inclusion criteria of the study were COPD patients based on doctors and physiotherapy examination, Age between 45-70 years, Ability to give informed consent, and both Male and Female patients. The exclusion Criteria of the study were Patients underwent recent thoracic surgery, Patients with congenital heart disease, ischemic heart disease, Rheumatic heart disease, and Patients with upper extremity fractures i.e. rib, shoulder, and neck. Patients with other respiratory conditions, neuromuscular disease, cardiac disease, bone cancer and Patients with restrictive lung disease.

Procedure: The study received ethical clearance by the Institutional Ethical Committee of Dr. A.P.J Abdul Kalam College of Physiotherapy, PIMS-DU. The sample size for this study was 40. Participants were selected from Inpatient department, Dr Vitthalrao Vikhe Patil Rural Medical Hospital.

Pre intervention baseline data of six minute walk test and modified Borg scale was assessed. Then the one week of supervised intervention was given to the patients. After one week post intervention data of six minute walk test and modified Borg scale were reassessed.

Intervention- three chest mobility exercises were given they are as follows.

- While sitting in a chair, have the patient reach with both arms overhead (180 degree bilateral shoulder flexion and slight abduction) during inspiration and then bend forward at the hips and reach for the floor during expiration.
- While the patient is sitting in a chair with hands clasped behind the head, have him or her horizontally abduct the arms (elongating the pectoralis major) during a deep inspiration. Then instruct the patient to bring the elbows together and bend forward during expiration.

- While sitting, have the patient bend away from the tight side to lengthen hypo mobile structures and expand that side of the chest during inspiration. Then, have the patient push the fist hand into the lateral aspect of the chest, bend toward the tight side, and breathe out .Progress by having the patient raise the arm overhead on the tight side of the chest and side-bend away from the tight side. This places an additional stretch on hypo mobile tissues.

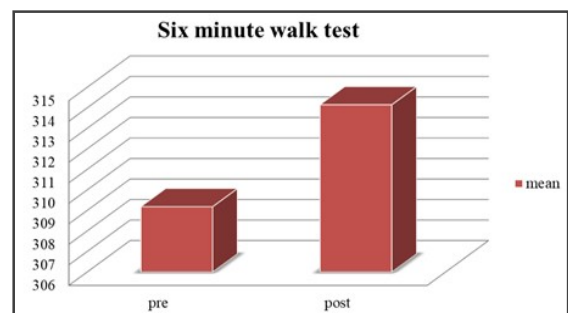
Protocol: Each chest mobility exercise will be given for 10 repetitions per set and 2 sets per day for one week.

Outcome Measures

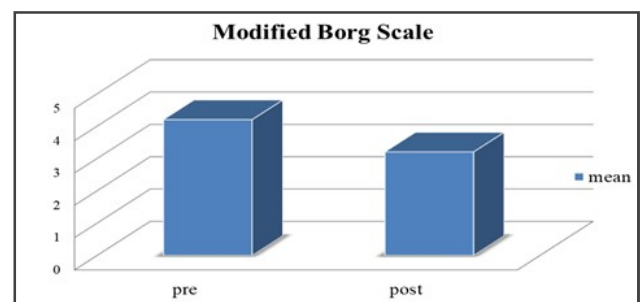
- A 6-minute Walk Test is done to measure the functional aerobic capacity of the patient.
- The modified Borg Scale is used to assess the rate of perceived exertion of the patient.

RESULTS

The pre-intervention value of 6MWD was 309.18±50.36 meters. and post intervention 6MWD value was 314.15±50.74. Pre-intervention 6MWD post Intervention 6MWD was compared and analyzed with a Paired t test. The mean difference of Pre and Post 6MWD was -4.975 meters with a t-value 18.823 and p value <0.0001, which shows an extremely significant difference in pre and post-intervention 6MWD. Table no 1 shows the mean difference of pre and post-intervention 6MWD. The pre-Intervention Modified Borg scale score Mean ± SD value was 4.20±1.52 and the post-Intervention Modified Borg scale score Mean ± SD value of the participants was 3.22±1.59. Pre-intervention Modified Borg scale score and post-intervention modified Borg scale score was compared and analyzed with a Paired t test. Mean difference of Pre-Post Modified Borg scale score was 0.975 with t- value of 10.691 and p-value <0.0001 which shows an extremely significant difference in pre and post-intervention Modified Borg scale score. Table no 2 shows the mean difference of pre and post-intervention Modified Borg scale values.



Graph 1. Pre and Post intervention mean of Six Minute walk test



Graph 2. Pre and Post intervention mean of Modified Borg Scale

Table 1. Pre and Post intervention mean of six-minute walk distance

VARIABLES	PRE (Mean ± SD)	POST (Mean ± SD)	t-VALUE	p- VALUE
6-minute walk test	309.18±50.36	314.15±50.74	18.823	<0.0001 (ExtremelySignificant)

Table 2. Pre and Post intervention mean of Modified Borg scale

VARIABLES	PRE (Mean ±SD)	POST (Mean ±SD)	t- VALUE	p-VALUE
Modified Borg scale	4.20±1.52	3.22±1.59	10.691	<0.0001(ExtremelySignificant)

DISCUSSION

Even though COPD is an obstructive form of lung disease, as the condition worsens, the chest wall stiffens and the diseased lung takes on a restrictive pattern. The progress of rehabilitation for a patient with COPD may be hampered if this small but crucial detail is overlooked. This restriction affects the physiology of the lungs and chest wall and prevents other rehabilitation protocols from helping the patient get better.²¹

The current research was carried out to investigate the influence of chest mobility exercises on rate of perceived exertion and functional capacity in chronic obstructive pulmonary disease patients. The chest mobility exercises as described in the intervention were given to the participants on the basis of inclusion criteria. Our study showed Pre and Post Intervention mean of six minute walk test as 309.18±50.36 and 314.15±50.74 respectively in meters, having t value 18.823 and p value <0.0001. Mean difference of pre and post intervention of Modified Borg scale was 4.22±1.52 and 3.22±1.59 respectively with t value 10.691 and p value <0.0001.

This shows significant improvement in the six minute walk distance and perceived rate of exertion after the chest mobility intervention. Chronic lung diseases, such Chronic Obstructive Pulmonary Disease (COPD), are extremely difficult to treat clinically and rehabilitate because of the low quality of life and long-term, permanent lung damage that makes intervention or rehabilitation protocols extremely difficult. The majority of issues include, for instance, air trapping and ruined parenchymal lung, which result in abnormalities of the chest wall and malfunction of the respiratory muscles, which are linked to dyspnea and a reduced ability to tolerate exercise. As a result of decreased elastic recoil and an increase in the volume of air still in the lung due to lung hyperinflation in COPD, air trapping occurs, leading to alveolar hypoventilation. Respiratory ventilation is thus impacted by weak respiratory muscles and poor biomechanic chest movement.²²

Effective muscle contraction is facilitated by the mechanism of this approach, which lengthens the intercostal muscles. This enhances the direction of anterior-upward upper costal and later outward lower costal movement, including downward diaphragm orientations, improving the biomechanics of chest movement. Achieving optimal relaxed recoil of the chest wall facilitates the efficient contraction of every intercostal muscle. Therefore, mobilization of the chest Using breathing, respiratory muscle exercise, or function training can help patients with chronic lung illness, particularly those with COPD who have a barrel-shaped chest or hyper inflated lungs. As a result, the chest wall mobilization treatment relieves accessory muscle use and dyspnea symptoms by improving flexibility, respiratory muscle function, and ventilatory pumping.²²

Sonia U Mulay et al (2017) conducted an experimental study on Effectiveness of shoulder and thoracic mobility exercises on chest expansion and dyspnea in moderate chronic obstructive pulmonary disease patients at Krishna Hospital's Pulmonology Department in Karad.¹ Another study on addition of chest mobilization or pursed lip breathing in conventional physiotherapy in COPD patients was carried out by Fidyatul Nazhira et al (2021) and has concluded that adding chest mobilization or PLB to traditional therapy was just as effective as standard hospital intervention.² Following the chest mobility exercises intervention, there was a statistically significant rise in 6MWD. According to earlier research, variations in breathing patterns, decreased stiffness of the chest wall, and improvements in ventilator capacity and chest wall compliance account for these increases in the distance traveled by various pulmonary disease patients. Different types of exercise can reduce the imbalance in pulmonary ventilation caused by exercise, which lowers the respiratory threshold and indirectly raises 6MWD.²¹ Thus from present study it can be concluded that chest mobility exercises can improve the 6MWD and Functional capacity in COPD patients.

CONCLUSION

This study concluded that chest mobility exercises improve 6-minute walk distance and the rate of perceived exertion in COPD patients.

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CONFLICT OF INTEREST: Author has no conflict of interest

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