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Bhramari Pranayama and Thoracic Mobility Exercises for Moderate Chronic Obstructive Pulmonary Disease (COPD): A Case Study

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Abstract:- Chronic obstructive pulmonary disease (COPD) is a global health issue and a significant cause of morbidity, disability, and mortality due to persistent respiratory symptoms and airflow limitations. COPD is diagnosed through pulmonary function testing, particularly spirometry, which measures the post bronchodilator FEV1/FVC ratio. The purpose of this study was to determine the effectiveness of Bhramari pranayama combined with thoracic mobility exercises on increasing exercise/activity tolerance in patient with moderate COPD. This case study is about a 60-year-old male with COPD who presented with breathlessness, cough, and mMRC grade 2 dyspnoea. His FEV1 was 58%, FVC was 75%, and FEV1/FVC (post bronchodilator) was 63%. The patient was given Bhramari pranayama and thoracic mobility exercise for a period of 4 days. After 4 days, there was improvement in dyspnoea severity, exercise capacity, thoracic expansion, FEV1, FVC, FEV1/FVC, and CAT questionnaire score. Hence, we concluded that Bhramari Pranayama and thoracic mobility exercises are effective in increasing exercise/activity tolerance in patient with moderate COPD.

Keywords:- *Bhramari Pranayama, Thoracic Mobility Exercises, COPD, Case Study.*

I. INTRODUCTION

Davidson's principles and practices of medicine defines Chronic Obstructive Pulmonary Disease (COPD) as a preventable and treatable disease characterized by persistent respiratory symptoms and airflow limitation that is due to airway and/or alveolar abnormalities, usually caused by significant exposure to noxious particles or gases.[1] COPD is one of the important causes of morbidity, disability and mortality around the globe with a high prevalence (approximately 10%) in the population aged between 30-79 years. [2] The 2017 Global Burden of Disease (GBD) study estimates that the global mortality of COPD is approximately 41.9 deaths per 100000 individuals (5.7% of total all-cause deaths). [3]

The risk factors for COPD are tobacco smoking, occupational exposures, air pollution, genetic factors, age, gender, lung growth and development, low socio-economic status, respiratory infections, asthma and airway hyper-reactivity. The symptoms are dyspnea, chronic cough, sputum production, wheezing, chest tightness, fatigue, weight loss, pedal edema (due to cor pulmonale), depression and anxiety. [4]

COPD is typically identified based on symptoms and associated risk factors. Pulmonary Function Testing (PFT) is utilized to diagnose, stage, and monitor the condition. This includes spirometry, laboratory testing, 6-minute walk tests, imaging of the lungs through radiography, oxygenation tests such as pulse oximetry or arterial blood gas analysis. Diagnosing COPD is specifically done through spirometry, where the post bronchodilator FEV1/FVC must be less than 0.7 for the diagnosis to be established. [5]

Pranayama is generally a technique of prolongation and control of breath. Prana means 'vital energy' or 'life force' and Ayama means 'extension' or 'expansion' in Sanskrit. Bhramari is a type of pranayama. It is simple and can be practiced by everyone irrespective of their age or gender. To practice Bhramari pranayama, the practitioner should sit in a comfortable pose and take slow, deep breaths through the nostrils. Upon exhaling, they must produce a humming sound similar to that of a bumble bee with the lips closed and ears blocked by fingers. [6]

Patients with COPD frequently experience dyspnea during normal daily activities when they use their upper extremities. Furthermore, since the muscles responsible for arm movements and trunk stabilization are connected to the rib cage, this increases chest wall resistance, thereby limiting one's ability to increase tidal volume during arm activities. Thoracic mobility exercises including active upper

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limb exercises are effective in reducing dyspnea and improving lung function, functional capacities and quality of life in patients with COPD.[7,8]

II. CASE DESCRIPTION

A. Subjective assessment

➢ *Chief Complaints-*

A 60- year old male with the history of COPD presented with the complaints of breathlessness, cough with difficulty in expelling the phlegm and easy fatigability.

➢ *History of Present Illness –*

Patient was said to be apparently normal 4 years ago, then he developed dyspnoea, which was insidious in onset, gradually progressive in nature, initially of Grade 1 Modified Medical Research Council (mMRC) progressed to Grade 2 mMRC in past 2 years. Dyspnoea aggravates on walking, stair climbing and going slight uphill, relieves on taking medications, no seasonal variations and no diurnal changes. The patient had COPD Assessment Test(CAT) score of 25. Patient had cough since 4 years which was insidious in onset, gradually progressive in nature and associated with expectorations (scanty, whitish and mucoid consistency). Patient had easy fatigability which was insidious in onset, gradually progressive, aggravates during exacerbation and relieves by taking rest. The patient was thus admitted to the KVG Medical College and Hospital's inpatient unit of the respiratory medicine and was referred for physiotherapy.

B. Objective Assessment

➢ *Physical Examination*

- *Initial Physical Exam-*

Temperature 97.5°F, heart rate 80bpm, SpO_2 98% on room air, respiratory rate 21 breaths/min, BP 130/80mmHg, height 169cm, weight 60kg, BMI 21kg/m^2.Patient was pallor. No icterus, cyanosis, clubbing, lymphadenopathy or edema.

- *Constitutional-*

Moderately built, well nourished, conscious, co-operative, well oriented to time, place and person.

➢ *Systemic Examination*

- CVS- S1 and S2 heard, no murmur.
- CNS- No focal neurological deficit.

➢ *Respiratory System-*

- *Inspection*

✓ Shape of chest – Barrel
✓ Trachea- Appears to be placed centrally
✓ Movements of chest- Reduced bilaterally
✓ Accessory muscle usage- Not seen

- *Palpation*

✓ All findings from inspection were confirmed.
✓ Trachea- Centrally placed.
✓ Movements of chest- Reduced bilaterally.
✓ Tactile fremitus- Normal and equivocal.
✓ Thoracic expansion measurement difference during inspiration and expiration-

▪ Axillary level- 1.5cm
▪ Nipple level-1cm
▪ Xiphoid level-1cm

- *Auscultation*

✓ Breath sounds- Decreased intensity of breath sounds.
✓ Vocal fremitus -Normal and equivocal

C. Investigations

➢ *Chest X-ray –*

- Lung hyper inflation
- Flattened hemi-diaphragms

➢ *PFT(Spirometry)-*

- FEV1- 58%
- FVC- 75%
- FEV_1/FVC (post bronchodilator)- 63%

III. INTERVENTION

The patient undertook a course of physiotherapy treatment consisting of Bhramari pranayama and thoracic mobility exercises for a period of 4 days.

➢ *Bhramari Pranayama*

- Frequency- 3 times/day
- Time-15 minutes
- Type- Breathing exercise

➢ *Thoracic Mobility Exercises*

- Frequency-3 times/day
- Intensity- According to patient's tolerance level
- Time-15 minutes
- Type-Range of motion exercise
- Along with physiotherapy, the patient also received bronchodilators and mucolytics.

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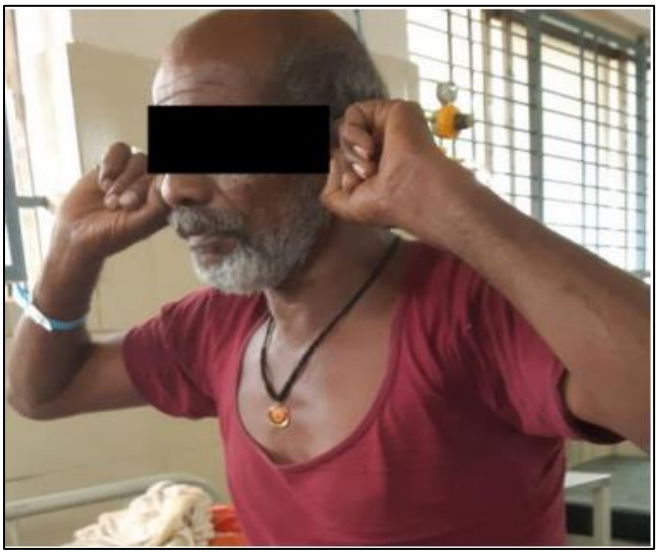

Fig 1 Patient Performing Bhramari Pranayama

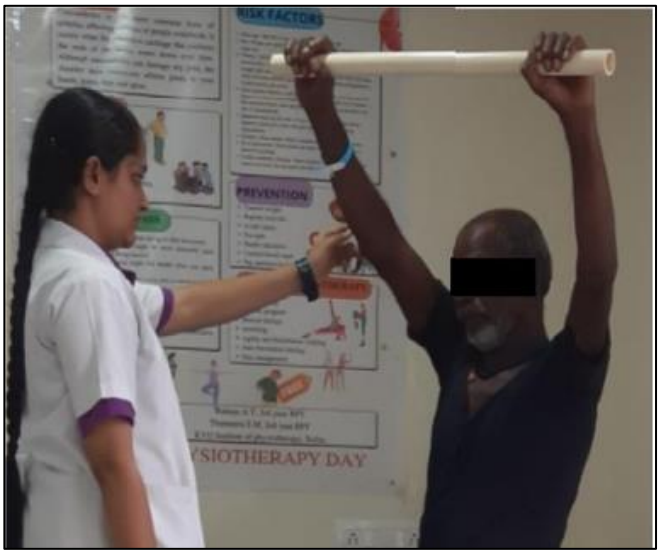

Fig 2 Patient Performing Thoracic Mobility Exercise

IV. RESULTS

Table 1 Results

Outcome measures	Values	
	Pre treatment	Post treatment
mMRC	**Grade 2**	**Grade 1**
CAT questionnaire	25	11
6 minute walk distance(The predicted value was from 411m to 563.5m for the patient)	405m	420m
PFT(spirometry)		
FEV1	58%	64%
FVC	75%	79%
FEV1/FVC	63%	75%
Thoracic expansion measurement difference		
Axillary level	1.5cm	1.8cm
Nipple level	1cm	1.4cm
Xiphoid level	1cm	1.6cm

V. DISCUSSION

This study aimed to determine the effectiveness of Bhramari pranayama combined and thoracic mobility exercises on increasing exercise/activity tolerance in patient with moderate COPD. A significant reduction was observed in dyspnoea after the treatment in the patient. The exercise tolerance improved on the other side.

During the pranayama, the lung inflates to the maximum, stimulating pulmonary stretch receptors. The stretch receptors reduce the tracheobronchial smooth muscle tone, resulting in decreased airway resistance and improved pulmonary function. [9] A study done by Jaysheela H states that Bhramari pranayama is effective in minimizing dyspnoea in COPD patients and improving their pulmonary functions. [10] The controlled breath and vibrational hum contribute to strengthening of respiratory muscles. The resonance created during humming sound stimulates the vagus nerve, which raises vagal tone and activates the parasympathetic nervous system. Thus, promoting relaxation and influencing respiratory regulation. [11,12] Kaminsky DA et al. (2017) at Vermont and Texas, USA, conducted a randomized double-blind, controlled pilot trial to find out the effect of Yoga breathing (Pranayama) on exercise tolerance in patients with COPD. They concluded that pranayama was associated with improved exercise tolerance in patients with COPD and may have significant clinical benefits for symptomatic patients with COPD. [13]

The muscles of the upper ribcage and shoulder girdle, which are responsible for respiratory and postural functions, have thoracic and extra thoracic attachment points. Any exercise that affects shoulder or trunk will mobilize the chest. [14] Upper extremity muscular training enhances the strength of the inspiratory muscles and improves ADL performance in patients with COPD. It also decreases fatigue and dyspnea perception during ADL. [15,16] The thoracic mobility exercises address both the structural and functional aspects of respiratory health, promoting optimal lung mechanics, enhancing endurance, and improving overall quality of life for individuals navigating the complexities of COPD.

This study has limitations, the subject received bronchodilators and mucolytics. This might also have had an impact on dilating the bronco tubes, loosening the secretions and expelling the phlegm. The study was conducted only for

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4 days and the long term effects were not analyzed. So, further study with large population size is recommended to evaluate the effectiveness of Bhramari Pranayama combined and thoracic mobility exercises on increasing exercise/activity tolerance in patient with moderate COPD.

VI. CONCLUSION

The present study demonstrated that Bhramari pranayama has positive impact on dyspnoea and loosening secretions. The thoracic mobility exercises help in maintaining the range of motion on upper limb and strengthen the respiratory muscles. When Bhramari pranayama is combined with thoracic mobility exercises, it can improve the exercise/activity tolerance of the patient. Hence, improving the quality of life.

- *Patient Informed Consent:*
  A written consent was obtained from the patient.

- *Funding:*
  No external funding received.

- *Conflicts of Interest:*
  There is no conflict of interest concerned with this study.

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