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COMBINED EFFECTS OF INSPIRATORY MUSCLE TRAINING AND BUTEYKO BREATHING TECHNIQUE ON REDUCE BREATHLESSNESS AND IMPROVE QUALITY OF LIFE IN ASTHMATICS

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ABSTRACT

Background:

Bronchial asthma is a chronic inflammatory airway disorder characterized by breathlessness, wheezing, and reduced quality of life. Along with pharmacological management, non-pharmacological interventions such as breathing exercises are gaining importance, especially in low-cost and community-based care settings in India. Inspiratory Muscle Training (IMT) strengthens the respiratory muscles, while the Buteyko Breathing Technique (BBT) focuses on controlled nasal breathing to reduce hyperventilation. However, evidence on the combined effect of these two techniques is limited.

Aim:

To study the combined effect of Inspiratory Muscle Training and Buteyko Breathing Technique on reducing breathlessness and improving quality of life in asthmatic patients.

Methodology:

A quasi-experimental study was conducted on 30 patients with bronchial asthma aged between 35–45 years, selected by purposive sampling from Sri Ramakrishna Multispecialty Hospital, Coimbatore. Participants underwent Inspiratory Muscle Training using a threshold IMT device along with Buteyko Breathing Technique for 6 weeks. Breathlessness was assessed using the Modified Borg Dyspnea Scale and quality of life was measured using the Asthma Quality of Life Questionnaire (AQLQ). Pre- and post-test values were analyzed using paired t-test.

Results:

The results showed a statistically significant reduction in breathlessness, with the mean Modified Borg Dyspnea score improving from 5.96 to 3.93 ($t = 6.213$). Quality of life also showed a significant improvement, with AQLQ scores improving from 3.26 to 2.1 ($t = 6.049$).

Conclusion:

The study concludes that the combined application of Inspiratory Muscle Training and Buteyko Breathing Technique is effective in reducing breathlessness and improving quality of life in asthmatic patients. Hence, the null hypothesis was rejected and the alternate hypothesis was accepted.

Keywords:

Bronchial Asthma, Inspiratory Muscle Training (IMT), Buteyko Breathing Technique (BBT), Breathlessness, Quality of Life, Modified Borg Dyspnea Scale, Asthma Quality of Life Questionnaire (AQLQ), Respiratory Rehabilitation.

INTRODUCTION

Bronchial asthma is a respiratory disease, usually characterized by chronic inflammatory disease of the airways. The narrowing of the airways is produced by the combination mucosal edema and bronchial secretion of muscle spasm. The main pathology is hyper reactivity of the airways producing shortness of breath during exertion. (1)

The prevalence of the bronchial asthma is higher in adults, less in younger age groups. The mean age group is 30-45 years and those with a family history of asthma. Further the prevalence of asthma is higher in males than females and it affects more than 300 million people worldwide. (2)

Further on higher prevalence in adults identified in agricultural dominant region, and post harvesting season (highest number of episodes of wheezing and breathlessness observed in months of December-January and April-May when crop harvesting season). (3

Asthma has two phases, one is early phase and another one is late phase. The early phase is initiated by IgE antibodies. When a pollutant or trigger factor gets inhaled the mast cells release cytokines. The mast cells release the histamine, prostaglandins, and leukotriene. These cells turn to contract the muscle and cause airway tightening. Mast cells play a crucial role in the late phase reactants to inflamed sites. The result of inflammation and bronchoconstriction cause increased work of breathing.

Airway hyper responsiveness is elevated by the histamine and it is produced by the mast cells. These mechanisms cause airway remodeling it may worsen inflammation and aggravate asthma. In combination with inflammation, granular white blood cells, exudate, and mucus occupying the bronchial trees, it can increase breathing difficulty. (5)

The quality of breathing is based on the respiratory muscle power and less muscle power produces shallow breathing with high respiratory rate. It produces high amount of CO2 in the lungs leading to acidic nature in the blood. Weakness of respiratory muscles mainly inspiratory muscle include the diaphragm, external intercostal muscles causes breathing difficulty and these are the major reason for reduced alveolar ventilation. Maximal inspiratory mouth pressure (PImax) is a measurement of the maximum negative pressure created when the airway is temporarily obstructed. It is used to evaluate respiratory muscle strength. (6)

Common clinical features include dyspnea, cough, chest tightness, and wheezing that vary over time and in intensity. The recurrent episodes of acute shortness of breath, typically occurring at night and early morning hours. (7)

Bronchial asthma is classified into two groups based on the symptoms one is early onset asthma – A genetic predisposition towards the IgE antibodies in response to stimulus by pollen, house dust, fungi, and animal derived proteins. In childhood period bronchial asthma is usually due to allergies. (8) Another one is late onset asthma – It is a non-allergic asthma in adults arising from some viral infections of the lower respiratory tract. (9)

Based on the types of severity it can further be classified. In episodic asthma symptoms occur in interval periods with dyspnea and paroxysms of wheezing with relatively sudden onset. (10)

In severe acute asthma (status asthmatics) symptoms present with unproductive cough. Physical signs including sweating, central cyanosis, tachycardia.(10)

¬ In chronic asthma the symptoms are wheeze, chest tightness, breathlessness on exertion, spontaneous cough produced in the night time and early morning Period (11)

First-line therapy for asthma involves the use of inhaled corticosteroids (ICS) in combination with inhaled beta2-agonists enabling both the control of airway hyper responsiveness. (12)

Anticholinergic drugs can be used to treat asthma by opening the airway in the lungs. Anticholinergics work by blocking the parasympathetic effects of acetylcholine on the airway smooth muscle and pulmonary parasympathetic nerves. They are generally well tolerated and have mild side effects. Anticholinergic relax bronchial smooth muscles through competitive inhibition of muscarinic cholinergic receptors. Corticosteroids inhibit airway inflammation, reverse beta-receptor down-regulation, and inhibit cytokine production and adhesion protein activation.(13) Immunomodulators are used to decrease the allergic response of the airway walls. Common bronchodilators are salbutamol, salmeterol, formeterol, and theophylline. Due to the high prevalence of asthma and associated healthcare costs, it is important to identify low cost alternatives such as breathing exercises. (14)

Breathing exercises (BTE) like Buteyko breathing and Inspiratory Muscle (IMT) Training are the non-pharmacological interventions for improvement of asthma control. (15)

Inspiratory Muscle Training is a quantitative technique which includes resistance exercise designed to strengthen inspiratory muscles by providing resistance during expiration. Threshold Inspiratory Muscle Training is a device used to strengthen the inspiratory muscles. (16) IMT is given for the inspiratory muscles to overcome the resistance. IMT produces effects in respiratory muscles like increasing the diaphragm thickness & strength, decrease in dyspnea level. IMT provides benefits like pulmonary function, respiratory muscle strength and endurance, increase levels of functional capacity, decrease emotional disorders and the use of medical services, improves quality of life.(17)

IMT was applied by Threshold Inspiratory device. The device creates a resistance to your inspiration, which makes your breathing muscles work harder. The main types of IMT devices are threshold trainer, resistive trainer, incentive spirometer..(18)

The Buteyko breathing technique (BBT) was introduced by the Russian scientist Dr. Konstantin Buteyko in 1950. This BBT technique is based on the breath holding maneuvers and breathes control to guide patients back to nasal breathing. It was designed to reduce breathing volumes and restores metabolic balance. This technique was aimed to reduce hyperventilation and encouraged slower, shallower breathing through the nose. It cans also improving athletic performance and sleeping quality.

BBT breathing was clinically effective and increases the bronchial volume and significant reduction of respiratory pharmacotherapy. BBT breathing technique improves the quality of life and lung function and reduces asthma symptoms and medication use. (20).Dyspnea level is measured by Modified Borg Dyspnea score; it includes assessment scale from 0 to 10, where 0 represents no dyspnea and 10 represents maximal dyspnea.(21)

MATERIALS AND METHODOLOGY

MATERIALS REQUIRED

- Threshold IMT device
- Spare mouth piece
- Stopwatch
- Chair
- Consent form
- Assessment form
- Paper and pen

METHODOLOGY

Study Design

The Study design was single group pre test and post test study design.

Study Setting

The study was conducted at Sri Ramakrishna Multispecialty Hospital.Coimbatore.

Sampling Method

Based on the following criteria 30 patients with bronchial asthma of the age group between 35 – 45 years were selected for the study by purposive sampling method.

Criteria For Sample Collection

Inclusion Criteria

- Patient who were diagnosed with bronchial asthma.
- Patients between the age group of 35-45 years.
- Both female and male were included in this study
- Patients willing to participate in the study
- Patient who were received bronchodilators

Exclusion Criteria

- Neurological deficit
- Other Respiratory and Cardiovascular impairment
- Recent myocardial infarction
- Brain tumor
- Ventilator support
- Heart Valvular disease
- Chronic infections disease like hepatitis, mononucleosis
- Metabolic disease

Study Duration

The study duration was 6 months.

Variables

Independent variable

- Inspiratory muscle training
- Buteyko breathing technique

Dependent variable

- Breathlessness rate
- Quality of life

Outcome measures

- Modified Borg Dyspnea scale
- Asthma quality of life questionnaire

Procedure

Inspiratory muscle training is done by inhaling against a load with maximum effort, followed by breathing in and out of 30 breaths. Maximum inspiratory pressure starts with 50% to 60%. Frequency of IMT is given twice a day, morning and evening, at least six hours a part.

THRESHOLD IMT:

POSITION:

High sitting and place the mouthpiece in mouth

BREATHING:

Inhale deeply and hard for about two seconds, then exhale 3 seconds through the device.

REPETITIONS:

Repeat 12-15 breaths for a minute.

DURATION:

Do this for 10-15 minutes per session.

METHOD:

1. Place the mouthpiece in mouth and seal it with lips
2. Breathe in as deeply and hard as can for about two seconds
3. Exhale through the device for 3 seconds

BUTEYKO BREATHING TECHNIQUE

PATIENT POSITION:

The patient is positioned comfortably in sitting with the spine erect and shoulders relaxed.

1. Breathing is carried out through the nose. The patient is instructed to take a small, gentle inhalation (2s) followed by a relaxed exhalation (3s).
2. After exhalation, the patient holds the breath by pinching the nose until a mild urge to breathe is felt; this duration is noted as the control pause.
3. Normal nasal breathing is then resumed with minimal effort. The cycle is repeated for several minutes, ensuring calm, reduced breathing without deep or forceful inhalations. The session typically lasts 10–15 minutes.

RESULT

Modified Borg dyspnea scale was used to quantify the score for breathlessness within the group , and the results indicated a significant improvement in the group ('t' value = 6.213). The mean value was 3.93, which is considered as statistically significant improvement to reduce the breathlessness.

Asthma quality of life questionnaire was used to quantify the score for quality of life within the group, and the results indicated a significant improvement in the group ('t' value = 6.049). The mean value was 2.1, which is considered as statistically significant improvement to increase the quality of life.

DISCUSSION

This study looked at whether doing Inspiratory Muscle Training (IMT) together with the Buteyko Breathing Technique (BBT) could help people with asthma feel less breathless and improve their quality of life. The results were encouraging. After the intervention, participants had lower scores on the Modified Borg Scale, meaning they felt less breathless. They also had better scores on the Asthma Quality of Life Questionnaire (AQLQ), showing an improvement in their daily living and well-being. In the present study, the mean Modified Borg Dyspnea score reduced from 5.96 ± 1.936 (pre-test) to 3.93 (post-test), with a paired t-value of 6.213, which is greater than the table value (2.145). This indicates a highly significant reduction in perceived breathlessness following the combined intervention. Chung et al., (2021), who observed significant reductions in dyspnea and improvements in inspiratory muscle strength after 12 weeks of IMT in adults with asthma. This suggests that IMT and BBT used together can be helpful for people with asthma.

The decrease in breathlessness is likely due to the benefits of IMT. This training strengthens the diaphragm and other breathing muscles, helping people breathe more easily and with less effort. Since asthma often causes narrow airways and tired breathing muscles, stronger inspiratory muscles can make a big difference. IMT may have helped participants breathe more efficiently and reduced the extra work needed to take a breath.

BBT added more positive effects. This technique teaches slow, calm nasal breathing and aims to correct fast or shallow breathing, which is common in asthma. BBT can help the body maintain better carbon dioxide levels and reduce over-breathing. This may lower bronchoconstriction and prevent asthma symptoms. These improvements match what past research has also found about BBT. This physiological mechanism has been supported by Vagedes et al. (2024) reported significant improvement in asthma control and functional breathing parameters following BBT, including reduced symptoms and enhanced clinical

outcomes in adult patients with asthma.

The improvement in AQLQ scores shows that the intervention helped not just physically, but emotionally and socially as well. Asthma can affect a person's confidence, activity level, and comfort in daily situations. After doing IMT and BBT, participants may have felt more in control of their breathing, less worried about breathless episodes, and more confident doing daily tasks. This likely improved their overall quality of life.

Combining IMT with BBT seems to be a helpful non-drug method for managing asthma. By strengthening breathing muscles and promoting calm, efficient breathing, this approach may reduce breathlessness and improve overall quality of life. It appears to be a useful addition to regular asthma treatment.

CONCLUSION

This study found that combining Inspiratory Muscle Training with the Buteyko Breathing Technique helps reduce breathlessness and improves quality of life in people with asthma.

Hence Null hypothesis rejected and Alternative hypothesis accepted in this study.

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