

Review of Literature on the Effects of Active Cycle of Breathing Technique for COPD Patients

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Abstract: *Chronic obstructive pulmonary disorder is a preventable and treatable disease with some significant extrapulmonary effects that may contribute to the severity in patients. This literature review aimed to determine the effects of active cycle of breathing techniques on chronic obstructive pulmonary disorder patients from various articles. Online search engines such as PubMed, and Google Scholar were searched. Fifteen articles were selected from 2009 to 2022. The data was tabulated according to the study type, the number of participants, conditions, treatment, and conclusion. According to this review of the literature, ACBT can successfully increase sputum output, cough efficacy, and airway clearance discharge in COPD patients. More research is needed to find out the effectiveness of ACBT on the other aspect of COPD patients.*

Keywords: COPD, Chronic Bronchitis, Asthma, Bronchiectasis, and Cystic Fibrosis

1. Introduction

Chronic obstructive pulmonary disease (COPD) is a poorly reversible disease of the lungs which is one of the major causes of morbidity and mortality worldwide.¹ COPD is a preventable and treatable illness with some vital extrapulmonary effects which will contribute to the severity in patients. The GOLD initiative defines COPD as airflow limitation that is not completely reversible. The flow of air limitation is typically progressive and associated with an abnormal inflammatory response of the lungs to relate to an abnormal inflammatory response of the lungs to noxious particles or gases.² The American Thoracic Society defines COPD in terms of chronic bronchitis and emphysema. Chronic bronchitis is characterized by the clinical symptoms of excessive cough and mucus secretion production; emphysema refers to chronic dyspnea, resulting from enlarged air spaces and destruction of respiratory organ tissue. Asthma is additionally characterized by the flow of air obstruction and inflammation. It involves hyper responsiveness of the airways to the stimulus. Therefore, the reversibility of functional deficits in asthma which differentiates it from COPD.^{1,2}

COPD is the fourth leading cause of mortality in the United States, the third most prevalent cause of certified illness in the United Kingdom, and by 2030, it will be the seventh leading cause of disability - adjusted life years and the fourth leading cause of death globally. The prevalence of COPD was 174 million and there were approximately 3.2 million deaths due to COPD worldwide. Some studies showed that the prevalence in India is 4.46% in males and 2.86% in females. However, the prevalence is likely to be underestimated due to the under diagnosis of COPD.^{1,3-5}

COPD is caused due to both harmful particles and gases. Role of tobacco smoking is the commonest cause of COPD worldwide. Other causes may include second - hand smoke,

environmental and occupational exposures, and alpha - 1 antitrypsin deficiency (AATD).⁶

Patients with COPD may have symptoms such as chronic and progressive dyspnoea, cough, sputum production, wheezing, chest tightness, and reduced exercise tolerance. In patients with acute exacerbation of COPD, the symptoms are aggravated on the far side of the traditional day - after - day variations. The standard of lifetime of patients with COPD is greatly affected. The risk factors of cough and sputum production can affect the patient's quality of life and lead to poor outcomes.^{7,8}

The Active Cycle of Breathing Technique (ACBT) was first used by Pryor in 1979. The patient performs ACBT to move and eliminate extra pulmonary secretions and enhance lung function. ACBT consists of breathing control, thoracic expansion exercise, and forced expiratory technique (FET) modifiable for every patient. ACBT aids bronchial clearance by increasing mucociliary clearance while decreasing deleterious effects such as hypoxemia or increased airflow obstruction. It strengthens respiratory muscles with airway clearance and improves respiratory functions in COPD patients.⁹

Therefore, this review article's main purpose was to analyse the outcome of ACBT as a treatment technique for COPD conditions and to gather documented evidence of ACBT.

Objective of the Study

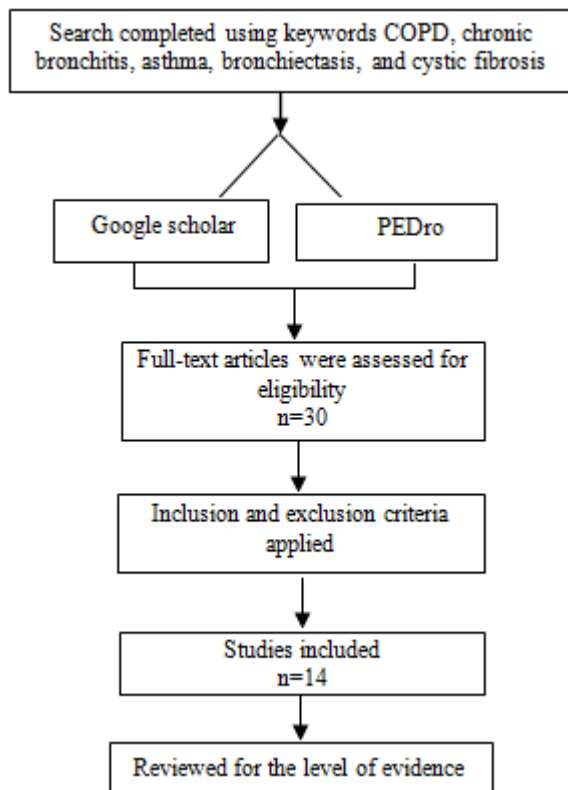
To evaluate a Literature review on the effect of Active Cycle of Breathing Techniques in COPD patients.

2. Materials and Methods

Literature Search Methodology

Online search engines used to collect journals were Google Scholar and PEDro. The authors identified articles based on

the keywords. The articles were collected in full text. A total of 30 articles were identified, out of which 17 were selected for review [Fig - 1].



Study Selection

Inclusion criteria: (1) Articles published in English language only; (2) ACBT, COPD, asthma, bronchiectasis, chronic bronchitis.

Exclusion criteria: (1) Articles published in other languages; (2) Duplicate articles; conference reports, case studies, guidelines, and newspapers; studies where ACBT was not clearly stated in the intervention.

Need of the study

A lung condition known as Chronic Obstructive Pulmonary Disease (COPD) is one of the leading causes of morbidity and mortality worldwide. It can lower exercise tolerance and have an impact on quality of life. This literature review is to evaluate the effectiveness of Active Cycle of Breathing Techniques in COPD patients.

3. Review of Literature

S. No.	Authors	Year	Study Design	Participants	Condition	Treatment	Conclusion
1.	ZisiD. et. al (10)	2022	Systemic review	117	Chronic respiratory disease	Active cycle of breathing (ACBT)	ACBT has a positive effect on respiratory system secretions clearance and pulmonary function over a short period of time. ACBT successfully increases expectorated sputum volume, decreases secretion viscoelasticity, and improves symptoms such as breathlessness.
2.	H. Mansha. et. al. (11)	2022	A quasi - interventional study	26	Chronic bronchitis	Active cycle of breathing technique (ACBT)	ACBT was more effective with conventional medicine among chronic bronchitis patients in comparison with patients with medicine alone. Significant differences were observed in symptoms, activity, impact, and total SGRQ scores of the experimental group.
3.	MD Shen. Et. al. (8)	2021	RCT	100 (each group 50)	Chronic obstructive pulmonary disease	ACBT and Respiratory medicine	The study was done by two groups. One is active cycle of breathing technique group that received a week - long intervention and another group is usual care group that received respiratory medicine. After a one week - long intervention, the ACBT group could significantly result in sputum production and respiratory function than the usual group.
4.	G. S. MOUSA. et. al. (12)	2021	Original articles	40	Pulmonary Function and Cough Difficulty in Chronic Bronchitis	RC - Cornet ACBT	The combined effects of RC - Cornet and Active cycle breathing methods have a beneficial effect on pulmonary function and cough difficulty ratings in chronic bronchitis, whereas ACBT alone has a similar but less positive effect.
5.	ZuritaZ. et. al (3)	2020	Quasi - experimental study	30	Chronic obstructive pulmonary disease	ACBT and PLB	On a tripod position, ACBT and PLB increase oxygen saturation and reduce shortness of breath but the tripod position with ACBT is more effective.
6.	V. Athawale. et. al (13)	2020	Original articles	40	Bronchiectasis	ACBT vs ACBT with	ACBT and the flutter device both show substantial progress in managing bronchiectasis

						flutter	patients, but when compared, both methods are equally successful.
7.	Mohit Gulati. et. al (2)	2020	RCT	20	COPD with cough and dyspnea	Conventional Physiotherapy vs ACBT with postural drainage	ACBT and AD were individually more effective techniques than conventional physiotherapy in improving cough production and dyspnoea.
8.	Meidi SHEN. et. al (9)	2020	Systemic Review and meta - analysis	8	Chronic obstructive pulmonary disease	Active cycle of breathing technique	ACBT has been shown to increase sputum output and breathing effectiveness in COPD patients. However, no definitive result was reached regarding the efficacy of ACBT on respiratory organ function, blood gas analysis, and other factors. More studies and quantitative analyses are required to prove ACBT's efficacy in other areas of COPD patients.
9.	Sundus S. et. al (14)	2017	Original articles	38	Asthma	Active cycle of breathing technique	The ACBT technique is a very beneficial intervention for improving the quality of life and functional capacity of patients with mild to moderate asthma. Further investigations are required to explore the efficiency of ACBT as a tool for cardio - pulmonary rehabilitation.
10.	S. M. Essayed. et. al. (17)	2015	Cohort study	45	Bronchiectasis	Active cycle of breathing technique	This study included 45 patients. They employed a six - minute walk test and the dyspnea index to evaluate functional ability. Following the treatment sessions, there was a significant improvement in both functional capacity and dyspnea severity, with a mean difference of 48.06 for the six - minute walk test and 29.2 for the dyspnea index.
11.	P. Senthil . et. al (18)	2015	Pre - post experimental study design	30	Bronchiectasis	ACBT vs ACBT with Acapella	Subjects were split into two groups for this investigation. Active cycle breathing technique (ACBT) was the only treatment given to Group A, which served as the control group. Group B, on the other hand, received ACBT with acapella for one month, 30 minutes per day. After the session, the experimental group's FEV1 and FVC increased. Acapella can be utilised in addition to ACBT as an adjuvant workout program to strengthen the airway
12.	Lucy K. Lewis Et. al (19)	2012	Systematic review and meta - analysis	24	Bronchiectasis; Cystic fibrosis	Active cycle of breathing technique	The typical chest physical treatment, positive expiratory pressure, and a control were the most frequently mentioned topics in the studies that made up this one. The three outcomes that were evaluated most frequently were forced vital capacity, forced expiratory volume in 1s, and sputum wet weight. Sputum wet weight, which was the main result, underwent meta - analysis. In comparison to traditional physiotherapy external oscillatory devices and control, the results showed an increase in sputum wet weight during and up to one hour after ACBT.
13.	Ganeswara Rao Melam. et. al (20)	2012	Comparative study	30	FEV, FVC & PEFR in COPD	Autogenic Drainage and ACBT	Team A, who received autogenic drainage, and team B, who received active cycle breathing technique, patients' FVC, FEV, and 1 PEFR values significantly improved as compared to team C patients who received only medication without any extra respiratory techniques. The FVC, FEV, and PEFR1 values between groups A and B, however, did not differ in a statistically significant way. The study's results showed that autogenic drainage and active cycle breathing are both effective ways to clear secretions, one of the causes of airway obstruction.
14.	NAFEEZ SYED. et. al	2009	A cross - over trial	35	Bronchiectasis	ACBT and Conventional chest	In this study, 35 patients in total were randomly assigned to receive either ACBT or traditional physiotherapy as the outcome was measured before and after the intervention. We assessed

						Physiotherapy	the pulmonary function, wet weight, volume of sputum expectorated, and the visual analog score (VAS) for each technique's level of comfort. Results from the intervention course showed that patients conducting ACBT dramatically improved their visual analog scores, and ACBT is also more comfortable for clearing the airway.
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4. Discussion

This review covered a total of fourteen studies. According to two RCTs included in this review, ACBT and ACBT combined with other therapies had a substantial impact on sputum output, respiratory function, coughing, and dyspnea. However, there is little change in the short term in sputum viscosity or quality of life.

Three systemic reviews and meta - analyses examined the effects of ACBT and found that it decreased expectorated sputum volume, decreased secretion viscoelasticity, and had a positive effect on the short - term improvement of respiratory tract secretions clearance and respiratory organ function.

The other three original studies demonstrate the effectiveness of ACBT as a treatment for enhancing the quality of life and functional capacity. Other interventions with ACBT have also been shown to have a positive impact on pulmonary function and cough difficulty, and Another study found no statistically significant difference between saturation level and dyspnea.

ACBT, along with other therapies, raised oxygen saturation and reduced shortness of breath in a quasi - experimental trial. According to one study, ACBT combined with conventional therapy was more effective than medication alone in chronic bronchitis patients. The experimental group's symptoms, activity, impact, and overall SGRQ scores differed significantly. According to a study conducted by P. Senthil, acapella can be utilized as a complement to ACBT to increase airway clearance and breathing. N. Sayed performs research and determines that there is no statistically significant change in wet sputum weight and volume observed following traditional and ACBT treatments. The Pulmonary Function Test results show that there is no statistically significant difference between the two interventions. With the majority of patients indicating comfort while doing ACBT, the VAS score demonstrated a statistically significant change. ACBT in postural drainage postures and standard thoracic physical treatment is also effective in clearing bronchiectasis airways.

G. R. M. et al. found a substantial improvement in FVC, FEV, and PEFr values in both A and B groups as compared to group C patients who got only drugs and no additional respiratory treatments. The study found that both autogenic drainage and the active cycle breathing approach are successful at clearing secretions, which is one of the causes of airway obstruction in COPD patients.

According to S. M. Essayed et. al. cohort. 's study, a six - minute walk test and dyspnea index significantly boosted functional capacity and dyspnea level after therapy sessions.

ACBT is also an excellent treatment for clearing airways and improving functional abilities.

5. Conclusion

This literature review analysed the effects of active cycle of breathing techniques for COPD patients. This study concludes that ACBT is more efficient at reducing sputum production, improving respiratory function, decreasing coughing and dyspnea, expectorated sputum volume, reducing secretion viscoelasticity, and having a positive effect on a short - term improvement in pulmonary function and secretion clearance in the respiratory tract. Additionally, when ACBT is combined with treatments, the clearance of secretion, six - minute walk test, and dyspnea rating all show potential.

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