



A Literature Review on the Impact of Active Cycle Breathing Techniques on Chronic Obstructive Pulmonary Disease

Kunal Patowary¹

¹Assistant Professor, Department of Physiotherapy, University of Science and Technology Meghalaya,
Ri-Bhoi, India

ABSTRACT

Background: Chronic Obstructive Pulmonary Disease is a progressive respiratory disorder characterized by persistent airflow limitation, mucus hypersecretion, dyspnea, and reduced functional capacity. Airway clearance techniques are commonly used in pulmonary rehabilitation to improve respiratory function and secretion removal. Among these techniques, the Active Cycle of Breathing Technique has gained considerable attention due to its effectiveness in improving airway clearance and reducing respiratory symptoms in COPD patients.

Objective: The objective of this literature review was to evaluate the impact of ACBT on pulmonary function, sputum clearance, dyspnea, oxygen saturation, and quality of life in patients with COPD.

Methodology: A literature review was conducted using electronic databases including PubMed, Scopus, Google Scholar, and Cochrane Library. Relevant articles published between 2015 and 2025 were selected. Randomized controlled trials, systematic reviews, meta-analyses, and experimental studies published in English were included in the review.

Conclusion: ACBT is a safe and efficient method of clearing the airways for people with COPD. It is easy to use, affordable, and appropriate for pulmonary rehabilitation programs, and it improves respiratory function, secretion clearance, exercise tolerance, and quality of life.

Keywords: Chronic Obstructive Pulmonary Disease, Active Cycle of Breathing Technique, COPD, ACBT, Sputum Clearance, Pulmonary Rehabilitation.

1. INTRODUCTION

Chronic Obstructive Pulmonary Disease is a progressive respiratory disorder characterized by persistent airflow limitation, chronic inflammation of the airways, excessive mucus production, and breathing

difficulty. Patients commonly experience symptoms such as dyspnea, chronic cough, sputum production, fatigue, and reduced exercise tolerance. The disease significantly affects the quality of life and functional independence of affected individuals.^[1] Chronic inflammatory changes in the lungs brought on by extended exposure to dangerous irritants are the cause of COPD. Neutrophils, macrophages, and CD8+ T cells are examples of inflammatory cells that build up in the lung parenchyma and airways.^[2] Airway inflammation leads to thickening of airway walls, mucus hypersecretion, fibrosis, and narrowing of small airways. Simultaneously, destruction of alveolar walls reduces elastic recoil and causes air trapping within the lungs.^[3] One of the main causes of illness and death worldwide, COPD is regarded as a significant global health issue. The World Health Organization estimates that COPD caused 3.5 million deaths worldwide in 2021, or roughly 5% of all fatalities.^[4,5]

Due to high levels of exposure to tobacco smoke, the burning of biomass fuels, occupational toxins, limited access to healthcare, and delayed diagnosis, low- and middle-income countries (LMIC) bear the brunt of the burden. LMICs account for over 90% of COPD-related mortality among people under 70.^[6] Due to rising smoking rates and indoor air pollution, South Asia, East Asia, and Sub-Saharan Africa are most impacted.^[7] The prevalence of COPD is also significantly increased globally by occupational exposure to dust, fumes, and chemicals.^[8] The Active Cycle of Breathing Technique (ACBT) is a commonly used airway clearance technique in respiratory physiotherapy. ACBT was first used by Pryor in 1979. It is intended to minimize respiratory discomfort and airway collapse while mobilizing and eliminating pulmonary secretions. Breathing control, thoracic expansion exercises, and forceful expiratory technique, sometimes known as puffing, are the components of ACBT. Together, these elements help COPD patients breathe more efficiently, enhance ventilation, and facilitate mucus clearance.^[9] The first part of ACBT is breathing control, which entails using the lower chest for comfortable diaphragmatic breathing with little movement of the upper chest. This stage encourages relaxation, lessens breathing effort, and guards against bronchospasm.^[10]

Huffing is the term for the forced expiratory method, which is forcefully exhaling through an open mouth and glottis without coughing excessively. Mucus is moved from tiny airways to bigger ones, where it can be evacuated more easily, by the dynamic airflow created by huffing.^[11] By boosting mucociliary clearance and reducing harmful consequences like hypoxemia or increased airflow blockage, ACBT promotes bronchial clearance. It enhances respiratory activities and fortifies respiratory muscles with airway clearance.^[12] The Active Cycle of Breathing Technique has become a key airway clearing method among cardio physiotherapy interventions because it can promote secretion mobilization, lessen dyspnea, and improve ventilation. In order to minimize airway collapse and respiratory exhaustion,

ACBT includes forced expiratory procedures, thoracic expansion exercises, and breathing regulation. There are differences in treatment methods, outcome metrics, intervention duration, and claimed effectiveness in COPD patients, despite the fact that multiple research projects have examined the efficacy of ACBT in chronic respiratory disorders. The purpose of this review of the literature is to provide an overview of the most recent research on the physiological and clinical effects of ACBT in the treatment of COPD. The study will assist in determining how well ACBT works to improve functional outcomes and lessen respiratory symptoms in COPD patients. Additionally, it will help researchers, physiotherapists, and medical professionals comprehend the therapeutic benefits of ACBT and its function in pulmonary rehabilitation.

2. METHODOLOGY

Study Design: In order to assess the effect of the Active Cycle of Breathing Technique on patients with Chronic Obstructive Pulmonary Disease, this study will be carried out as a review of the literature. Results from previously published research articles, clinical trials, systematic reviews, and evidence-based studies pertaining to ACBT and COPD care will be analyzed and summarized in this study.

Data Sources: Electronic databases such as PubMed, Scopus, Google Scholar, and the Cochrane Library will be used to gather pertinent literature using keywords Active Cycle of Breathing Technique, Chronic Obstructive Pulmonary Disease, Airway Clearance Technique, Pulmonary Rehabilitation, Respiratory Physiotherapy, Randomized controlled trials, and Systematic reviews. A total of 9 articles were all collected in full text.

2.1 Inclusion Criteria:

1. Studies involving patients diagnosed with COPD.
2. Studies evaluating the effects of ACBT on respiratory function, sputum clearance, dyspnea, oxygen saturation, exercise tolerance, or quality of life.
3. Randomized controlled trials, clinical trials, systematic reviews, meta-analyses, and experimental studies with higher methodological value.
4. Articles published in the English language.
5. Full-text articles published between 2010 and 2025.
6. Articles which are free.

2.2 Exclusion Criteria:

1. Studies involving respiratory diseases other than COPD without separate COPD analysis.
2. Non-English articles.
3. Abstract-only publications without full text.
4. Case reports, conference abstracts, editorials.
5. Duplicate studies and articles with insufficient methodological details.
6. Articles published before 2010.

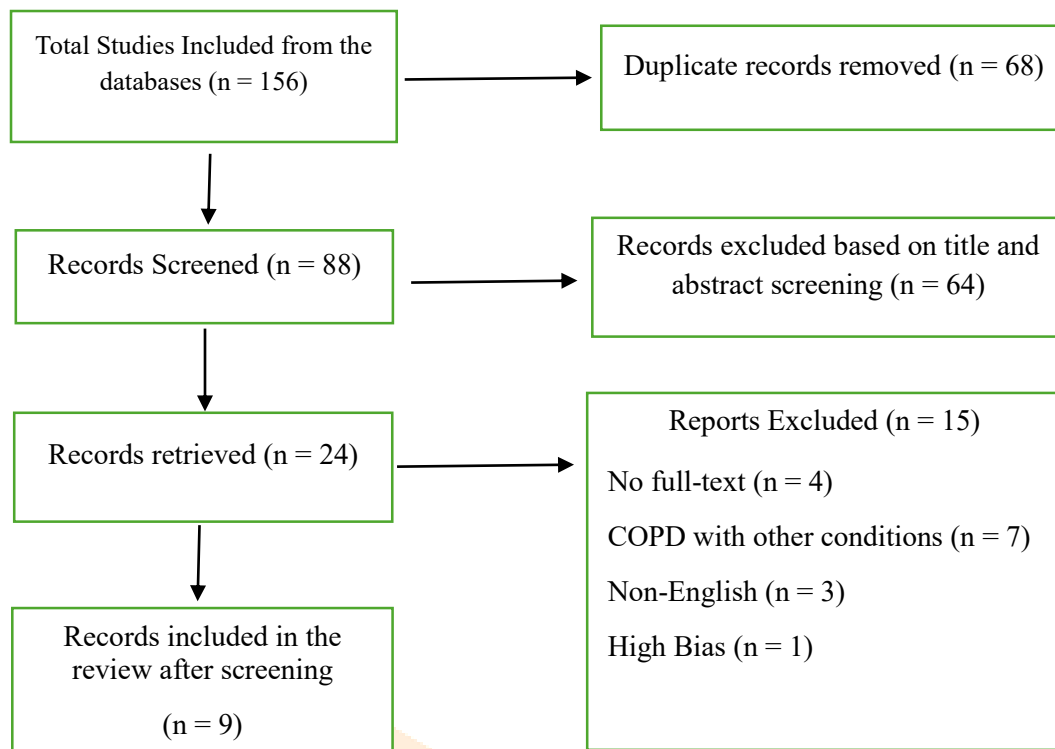


Figure 1- Flow chart of studies assessed in the systematic review

3. REVIEW OF LITERATURE

Table 1 – General study characteristics of the articles

	Authors	Study design	Treatment	Sample Size	Outcome measures	Results
1	Sabir et al. 2025 ^[13]	Randomized Controlled Trial (RCT)	Group A used ACBT and Group B used ACBT with Acapella device	54	Pulmonary Function Tests (PFT), Sputum volume, and Multidimensional Dyspnea Profile (MDP)	For COPD patients, the combination of Acapella with ACBTs improves pulmonary function, dyspnea, and airway clearance more effectively than ACBT alone.
2	Baig et al. 2024 ^[14]	RCT	Buteyko Breathing Technique (BBT) group received nasal breathing, breath-holding, and rest periods between cycles & ACBT group received Breathing control, Thoracic expansion exercise, and forced expiratory technique (FET)	40	Modified Borg Scale (MBS), and St. George's Respiratory Questionnaire (SGRQ).	Although both approaches were helpful, BBT was more successful than ACBT.
3	Haider et al. (2024) ^[15]	RCT	Group A received supervised ACBT - breathing control, diaphragmatic breathing, sniffing, and huffing and Group B received	44	SGRQ), 30-second arm curl test, and 6-minute walk test (6MWT)	Compared to Group A, Group B demonstrated more notable improvements in respiratory symptoms and exercise capacity.

			ACBT + warm-up, aerobic training, resistance training, balance training, and a cool-down.			
4	Zisi et al. 2022 ^[16]	Systematic Review		11 studies included in the review		ACBT positively influences the clearance of respiratory system secretions and enhances pulmonary function in the short term and alleviates symptoms like dyspnea.
5	Shen et al. 2021 ^[17]	RCT	ACBT group received breathing control, thoracic expansion exercise, and forced expiration technique and the other group received usual care, and advice regarding their health plan	100	Sputum viscosity and production by using viscometer	Sputum viscosity is not improved by the ACBT approach; however, it can greatly increase sputum production and enhance respiratory function.
6	Zurita et al. 2020 ^[18]	Experimental Study	The first group used a tripod position with lip breathing technique (PLBT) and the other group used tripod position with ACBT	30	Oxygen saturation	The tripod posture with both ACBT and PBLT may improve oxygen saturation and lessen nasal dyspnea, the tripod position with ACBT is more successful.
7	Gulati et al. 2020 ^[19]	RCT	Experimental group (EG) received ACBT, Autogenic drainage (AD) and Active Range of Motion (AROM) for both upper extremities while the control group (CG) received Deep Breathing Exercises followed by AROM of both upper Extremities, Huffing and Coughing.	20	Modified Borg Dyspnoea Scale	When it came to reducing cough output and dyspnea, ACBT and AD were both more successful than traditional physiotherapy.
8	Shen et al. 2020 ^[20]	Systematic Review		8 articles included in the study		In COPD patients, ACBT has shown to enhance sputum production and respiratory efficiency. Regarding the effectiveness of

						ACBT on blood gas analysis, respiratory organ function, and other aspects, no conclusive result was found.
9	Pawadshetty et al. 2016 ^[21]	RCT	Intervention group received ACBT while control group received AD	34 (Ex Group = 17, Control = 17)	Peak Expiratory Flow Rate (PEFR), and borg scale	When compared to autogenic drainage, ACBT was found to be more successful at increasing peak expiratory flow rate and lowering dyspnea in COPD patients.

4. DISCUSSION

This literature review evaluated the impact of the Active Cycle of Breathing Technique on patients with Chronic Obstructive Pulmonary Disease by analyzing findings from systematic reviews, randomized controlled trials, and experimental studies. A total of 9 studies were involved among them 6 were RCTs, 2 systematic reviews and 1 experimental study. Most of the reviewed articles support the implication of ACBT. ^[13,15,16,18,20,21] There are few studies ^[14,19] that showed the comparison of ACBT and found out there was no significant differences.

The systematic review ^[16] was important and high-quality article included in this review. The inclusion of RCTs improved the quality of evidence presented in the review. This study includes more current clinical trials and specifically assessed the efficacy of ACBT in chronic respiratory illnesses. Improvements in pulmonary function metrics, including Forced Expiratory Volume in 1 second (FEV1), Forced Vital Capacity (FVC), dyspnea, and sputum clearance, were shown in the article. This review included more recent data and improved understanding of the function of ACBT in pulmonary rehabilitation when compared to earlier research. Most of the studies involve ACBT with other interventions and found more improvement. ^[13,15,19] while they contain small sample size with less follow-ups. This is the drawback of the RCTs, a small sample size can significantly affect the quality, reliability, and generalizability of RCTs. Follow-up assessment is essential to determine whether the effects of an intervention are maintained over time or whether the outcomes are only temporary. Without adequate follow-up, researchers cannot evaluate the long-term effectiveness, sustainability, or recurrence of symptoms after treatment.

The efficacy of Active Cycle of Breathing Technique (ACBT) in patients with Chronic Obstructive Pulmonary Disease (COPD) was assessed in a systematic review conducted by Ming Shen and colleagues. The review found that by increasing airway clearance and lowering respiratory problems, ACBT may assist improve sputum clearance, pulmonary function, and quality of life in COPD patients. The authors considered intervention studies that evaluated ACBT's therapeutic benefits and contrasted it with other airway clearance methods or traditional respiratory therapy. According to the results, ACBT may be a useful supplemental treatment in pulmonary rehabilitation for the treatment of COPD. ^[20]

The review did, however, also draw attention to a number of shortcomings that diminished the overall quality of the data, such as small sample numbers, methodological heterogeneity among studies, changes in intervention length, and limited long-term follow-up. In order to verify the efficacy of ACBT in COPD patients, the authors suggested additional high-quality randomized controlled trials with bigger sample numbers and consistent methodologies. ^[20] The symptoms of Chronic Obstructive Pulmonary Disease

(COPD) can be improved more when Active Cycle of Breathing Technique (ACBT) is combined with additional treatment procedures than when ACBT is used alone. Airway blockage, mucus retention, decreased lung function, dyspnea, and decreased exercise tolerance are the hallmarks of COPD, a complex respiratory disease. A multimodal rehabilitation strategy is frequently more successful in controlling the illness because a variety of physiological and functional factors influence the severity of symptoms.

Physiotherapy and rehabilitation techniques such as PLBT, Diaphragmatic Breathing Exercises, AD, Aerobic Exercise, and Breathing Control Techniques should be combined with ACBT in the management of Chronic Obstructive Pulmonary Disease to improve airway clearance, reduce dyspnea, enhance lung function, and increase exercise tolerance. These techniques are often integrated as part of a comprehensive pulmonary rehabilitation program. The review showed that multidisciplinary ACBT protocol has higher effect than ACBT alone.

5. CONCLUSION

The existing evidence shows that the Active Cycle of Breathing Technique is an effective airway clearance strategy for patients with Chronic Obstructive Pulmonary Disease. ACBT reduces respiratory pain and increases exercise tolerance while increasing sputum clearance, pulmonary function, oxygenation, and dyspnea, according to data from clinical research and systematic reviews. ACBT seems to be more effective, less taxing, and more appropriate for autonomous practice as compared to traditional physiotherapy. To determine long-term efficacy and its influence on quality of life and exacerbation prevention, further extensive randomized controlled trials are necessary.

6. LIMITATIONS

There are a number of limitations to this literature review that should be taken into account when evaluating the results. The statistical strength and generalizability are diminished by the small sample sizes in many of the included research. Study design, intervention procedures, treatment duration, number of ACBT sessions, outcome assessments, and participant severity of COPD were all found to vary. A number of studies included mixed populations that included COPD patients as well as those with bronchiectasis, cystic fibrosis, and other chronic respiratory conditions. Because of this, certain results could not be totally unique to COPD, which would restrict the interpretation of ACBT's efficacy in relation to the condition. There was little data on long-term results, such as the avoidance of exacerbations, hospitalization rates, the advancement of the illness, and long-term improvements in quality of life.

7. FUTURE PROSPECTIVES

Future studies should also establish standardized treatment protocols regarding the duration, frequency, intensity, and sequence of ACBT exercises. Further research is needed to evaluate the isolated effects of ACBT without combining it with multiple pulmonary rehabilitation interventions. Many previous studies used ACBT along with postural drainage, breathing exercises, or aerobic training, making it difficult to determine the independent contribution of ACBT to patient improvement.

8. REFERENCES

1. Global Initiative for Chronic Obstructive Lung Disease. Global strategy for the diagnosis, management and prevention of chronic obstructive pulmonary disease. 2024 report.
2. Duncan D. Chronic obstructive pulmonary disease: an overview. *British Journal of Nursing*. 2016 Apr 14; 25 (7): 360 - 6.
3. Vogelmeier CF, Criner GJ, Martinez FJ, Anzueto A, Barnes PJ, Bourbeau J, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive lung disease 2024 report. *Am J Respir Crit Care Med*. 2024;209(1): e1-e80.
4. Celli BR, Wedzicha JA. Update on clinical aspects of chronic obstructive pulmonary disease. *N Engl J Med*. 2019;381(13):1257-66.
5. Wang, Z., Lin, J., Liang, L. *et al*. Global, regional, and national burden of chronic obstructive pulmonary disease and its attributable risk factors from 1990 to 2021: an analysis for the Global Burden of Disease Study 2021. *Respir Res* 26, 2 (2025)
6. Li HY, Gao TY, Fang W, Xian-Yu CY, Deng NJ, Zhang C, Niu YM. Global, regional and national burden of chronic obstructive pulmonary disease over a 30-year period: Estimates from the 1990 to 2019 Global Burden of Disease Study. *Respirology*. 2023 Jan;28(1):29-36.
7. Cao Z, Tong X, He L, Luo Y, Huang K, Li W, et al. Burden of chronic obstructive pulmonary disease and its attributable risk factors in 204 countries and territories, 1990–2021: results from the Global Burden of Disease Study 2021. *BMJ Public Health*. 2026;4:e002489
8. The global burden of COPD: epidemiology and effect of prevention strategies. *Lancet Respir Med*. 2025;13(8):709-724.
9. Lewis LK, Williams MT, Olds TS. The active cycle of breathing technique: a systematic review and meta-analysis. *Respir Med*. 2012;106(2):155-72.
10. Bott J, Blumenthal S, Buxton M, Ellum S, Falconer C, Garrod R, et al. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. *Thorax*. 2009;64(Suppl 1):i1-i51.
11. McIlwaine M, Button B, Dwan K. Positive expiratory pressure physiotherapy for airway clearance in people with cystic fibrosis. *Cochrane Database Syst Rev*. 2015;(6):CD003147.
12. Hough A. *Physiotherapy in respiratory care: an evidence - based approach to respiratory and cardiac management*. Nelson Thornes; 2001; 65 – 66
13. Mishal Sabir, Rizwanullah, Anna Bretches, Adela Damm, Shivani Shah, & Rimsha Kausar. (2025). effectiveness of active cycle of breathing technique with and without acapella in improving airway clearance, dyspnea, and pulmonary function in copd patients: a randomized controlled trial. *Journal of Population Therapeutics and Clinical Pharmacology*, 32(1), 1018-1029.
14. Baig B, Anwar M, Rasheed M, Rasul A, Fiaz A, Faisal S. 2024. Comparative Effects of Buteyko Breathing Technique and Active Cycle of Breathing Technique on Dyspnea and Quality of Life in Patients with Chronic Obstructive Pulmonary Disease. *Journal of Health and Rehabilitation Research*. 4(1):250–255.
15. Haider S, Ain QU, Amjad M, Sajjad Y, Javed Z, Kausar F. 2024. Effects of Home-Based Pulmonary Training Program on Functional Exercise Capacity and Quality of Life in Patients with Chronic Obstructive Pulmonary Disease. *Journal of Health and Rehabilitation Research*. 4(1):1474–1478.
16. Zisi D, Chrysanthopoulos C, Nanas S, Philippou A. The effectiveness of the active cycle of breathing technique in patients with chronic respiratory diseases: A systematic review. *Heart & Lung*. 2022 May 1; 53: 89 - 98.
17. Shen MD, Li YW, Xu LQ, Shi HY, Ni YY, Lin HJ, et al. Role of active cycle of breathing technique for patients with chronic obstructive pulmonary disease: A pragmatic, randomized clinical trial. *Int J Nurs Stud*. 2021; 117.

18. Zuriati Z, Surya M. Effectiveness Active Cycle of Breathing Technique (ACBT) with Pursued Lips Breathing Technique (PLBT) to tripod position in increase oxygen saturation in patients with COPD, West Sumatera. *Enfermeria Clinica*.2020 Jun 1; 30: 164 - 7.
19. Gulati M. An Immediate Effect of Conventional Physiotherapy versus ACBT with Autogenic Drainage on Dyspnoea and Cough in Patient with COPD - A Randomized Control Trial. *Int J Res Appl Sci Eng Technol*.2020; 8 (9): 709–13.
20. Shen M, li y, ding X, Xu l, li f, lin h. Effect of active cycle of breathing techniques in patients with chronic obstructive pulmonary disease: a systematic review of intervention. *Eur J phys rehabil Med* 2020; 56:625-32.
21. Pawadshetty, V., Munde, S.D., Sureshkumar, T., & Pawadshetty, U. (2016). A Study to Evaluate the Effect of ACBT Over Autogenic Drainage Technique in COPD Patients- A Comparative Study. *Indian Journal of Physiotherapy and Occupational Therapy—An International Journal*, 10, 86-90.

