

Original Article

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

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) significantly impacts the quality of life due to symptoms like dyspnea. Non-pharmacological interventions, particularly breathing techniques, have gained attention for their potential to improve patient outcomes.

Objective: This study aimed to compare the effectiveness of the Buteyko Breathing Technique (BBT) and the Active Cycle of Breathing Technique (ACBT) in reducing dyspnea and enhancing the quality of life in COPD patients.

Methods: In a randomized clinical trial conducted at Jinnah Hospital, Lahore, 40 COPD patients (mean age 59.70 ± 5.89 years; 70% male) were assigned to either BBT or ACBT groups. Both groups received standard treatments of bronchodilators and inhaled corticosteroids. The intervention involved three sessions per week for six weeks. Dyspnea was measured using the Modified Borg Scale (MBS), and quality of life was assessed through the St. George's Respiratory Questionnaire (SGRQ). Normality of data was confirmed via the Shapiro-Wilk test, and parametric tests (paired and independent T-tests) were used for statistical analysis.

Results: Pre-treatment MBS in the BBT group was 6.7 ± 1.56 , reducing to 2.9 ± 1.21 post-treatment. The SGRQ scores also showed improvement from 71.5 ± 8.44 to 36.8 ± 6.6 . In the ACBT group, the MBS score decreased from 7.3 ± 1.56 to 3.95 ± 1.36 , and SGRQ scores from 71.6 ± 8.46 to 42.55 ± 6.61 . The between-group comparison indicated a more significant improvement in the BBT group, with post-treatment p-values of 0.01 for MBS and 0.009 for SGRQ.

Conclusion: Both BBT and ACBT effectively improved dyspnea and quality of life in COPD patients, with BBT showing a greater impact. These findings suggest that BBT could be a preferable non-pharmacological intervention in COPD management. However, individual patient factors should be considered when choosing the appropriate technique.

Keywords: Chronic Obstructive Pulmonary Disease, Buteyko Breathing Technique, Active Cycle of Breathing Technique, Dyspnea, Quality of Life, Non-pharmacological Interventions.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD), recognized as the fifth leading cause of morbidity and mortality in the developed world, presents a significant economic and social challenge. Often under-diagnosed and under-treated, COPD arises primarily from prolonged exposure to harmful particles or gases, with tobacco smoking being the predominant cause globally. Other contributing factors include second-hand smoke, environmental and occupational exposures, and alpha-1 antitrypsin deficiency (AATD) (1,2). Symptoms of COPD, such as dyspnea, cough, and expectoration, lead to a decline in patients' quality of life. Exacerbations, often triggered by respiratory infections or environmental factors, can aggravate the condition (3-5). The WHO's 2004 estimates indicate that 64 million people are affected by COPD, with 3 million deaths annually. Predictions suggest that COPD will become the third leading cause of death worldwide by 2030 (6,7).

COPD affects approximately one-tenth of the global population and is identified as a major unmet health need. The presence of comorbidities, including cardiovascular disease, diabetes, and hypertension, further impacts patients' quality of life, exacerbation frequency, and survival (8-10). COPD exacerbations are commonly caused or triggered by bacterial and viral infections, as well as air pollution, and often necessitate treatment with corticosteroids and bronchodilators (11,12). The inflammatory nature of COPD involves the airways, lung parenchyma, and pulmonary vasculature, potentially resulting from oxidative stress and protease-antiprotease imbalances. Emphysema, a structural change seen in COPD, is characterized by the destruction of alveolar air sacs, leading to obstructive physiology (13,14).

The American Association for Respiratory Care (AARC) has highlighted the effectiveness of non-pharmacologic airway clearance therapies, such as the Active Cycle of Breathing Technique (ACBT), in managing COPD. ACBT, which comprises breathing control, thoracic expansion exercises, and the forced expiratory technique (FET), has been shown to increase expectorated sputum volume, reduce secretion visco-elasticity, and relieve symptoms like dyspnea (15-17). A survey in Sweden revealed that 75% of physiotherapists prescribe airway clearance treatments for most COPD patients, with ACBT being the most commonly used technique. A systematic review further supports the efficacy of ACBT in improving lung function, arterial blood gas levels, perceived dyspnea, and overall quality of life (18,19).

Given the critical nature of secretion production and retention in COPD, the first step in management is the prompt removal of secretions to prevent infection and further complications. The Buteyko Breathing Technique, aimed at retraining breathing patterns, and the ACBT, focused on secretion removal, are both widely used. However, the comparative effects of these techniques on quality of life and dyspnea in COPD patients remain to be comprehensively examined.

This study aims to explore the comparative effects of the Buteyko Breathing Technique and the Active Cycle of Breathing Technique on dyspnea and quality of life in COPD patients. The null hypothesis posits that there is no difference between the effects of the two techniques in improving these parameters in COPD patients. Conversely, the alternate hypothesis suggests a significant difference between their impacts. This research thus seeks to contribute valuable insights into the optimal management of dyspnea and quality of life in individuals suffering from COPD.

MATERIAL AND METHODS

This randomized clinical trial, registered under NCT05947253, was conducted over a period of ten months, post-approval of the synopsis, in the pulmonary ward of Jinnah Hospital, Lahore. The study aimed to compare the effects of the Buteyko Breathing Technique (BBT) and Active Cycle of Breathing Technique (ACBT) on dyspnea and quality of life in COPD patients. The sample size, determined using epitool software with an attrition rate of 10%, was set at 40 (18). Participants were recruited using a non-probability convenient sampling technique and were subsequently categorized into two groups through simple random sampling.

Participants included in the study were aged between 50 and 70 years, with a clinical diagnosis of COPD confirmed by smoking history and irreversible airflow limitation shown in pulmonary function tests (PFT). They were required to be hemodynamically stable and capable of completing the International Physical Activity Questionnaire (IPAQ) (20). Exclusion criteria included patients with Type II diabetes mellitus, unstable cardiac disease, pulmonary decompensation, disabling diseases preventing participation in the exercise program, systemic illness, resting O₂ saturation below 90% with room air breathing, and those with viral infections (20).

Data were collected using two primary tools: the Borg Dyspnea Scale (MBS) and the St. George's Respiratory Questionnaire (SGRQ). The Borg Dyspnea Scale, a subjective rating scale, assesses perceived dyspnea during physical activity or exercise, with scores ranging from 0 to 10 (21). The SGRQ, a self-reported assessment, evaluates the quality of life in obstructive airway diseases, consisting of 50 items across three domains: symptoms, activity, and impact. Each item is scored on a scale of 0 to 100, with higher scores indicating greater impairment (22-24).

Demographic data (age, gender) were collected at the outset. Pre-intervention measurements using the MBS and SGRQ were taken for all participants. Baseline treatment for both groups included inhaled bronchodilators and corticosteroids administered twice daily. Participants in Group A were then subjected to the Buteyko Breathing Technique, involving nasal breathing, breath-holding, and rest periods between cycles. Each session lasted 35 minutes, conducted three days per week for six weeks (25). Group B participants underwent the Active Cycle of Breathing Technique, with each session consisting of three cycles of 10 minutes each, interspersed with 20-minute breaks, totaling 35 minutes per session, also conducted three days per week for six weeks (26). Post-intervention data were collected using the SGRQ and MBS after six weeks.

Data analysis was performed using SPSS version 25. The study was conducted in accordance with ethical standards and guidelines, ensuring confidentiality and informed consent from all participants. As a single-blinded study, participants were unaware of the group allocations, thereby reducing bias in self-reported measures. The comparative analysis aimed to provide insights into the

efficacy of BBT and ACBT in improving dyspnea and quality of life in COPD patients, contributing significantly to the field of respiratory therapy and rehabilitation.

Gender Distribution of COPD Participants

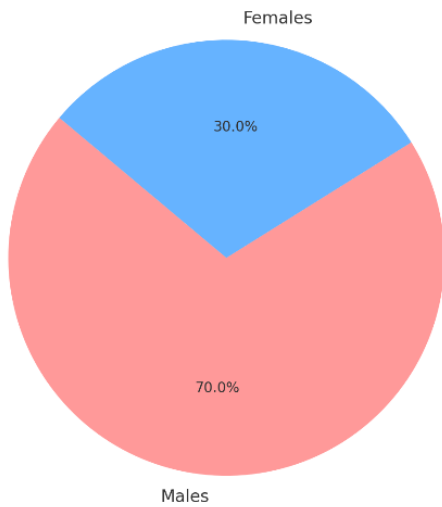


Figure 1 Gender

RESULTS

In this randomized clinical trial involving 40 patients with Chronic Obstructive Pulmonary Disease (COPD), the effectiveness of two breathing techniques – the Buteyko Breathing Technique (BBT) and the Active Cycle of Breathing Technique (ACBT) – was evaluated in terms of improving dyspnoea and quality of life (QOL). The demographic profile of the study participants revealed a mean age of 59.70 years (\pm 5.89 years) with a gender distribution of 70% males (n=28) and 30% females (n=12). The normality of the data was confirmed by the Shapiro-Wilk test, where all values exceeded 0.05, suggesting a normal distribution. Consequently, parametric tests, specifically paired and independent T-tests, were employed for the analysis.

The impact of BBT (Group A) was assessed using the Modified Borg Scale (MBS) and the St. George's Respiratory Questionnaire (SGRQ). Initially, the mean pre-treatment MBS score was 6.7 (\pm 1.56), which significantly decreased to 2.9 (\pm 1.21) post-treatment.

Table 1 WITHIN GROUP COMPARISON – BBT Group (group A)

	Mean	Standard deviation	p-value
Pre-treatment MBS	6.7	1.56	0.000
Post-treatment MBS	2.9	1.21	
Pre-treatment SGRQ	71.5	8.44	0.000
Post-treatment SGRQ	36.8	6.6	

Similarly, the pre-treatment SGRQ score showed a substantial reduction from 71.5 (\pm 8.44) to 36.8 (\pm 6.6) following the intervention.

Table 2 WITHIN GROUP COMPARISON – ACBT group (group B)

	Mean	Standard deviation	p-value
Pre-treatment MBS	7.3	1.56	0.000
Post-treatment MBS	3.95	1.36	
Pre-treatment SGRQ	71.6	8.46	0.000
Post-treatment SGRQ	42.55	6.61	

The p-value for both MBS and SGRQ was 0.000, underlining the statistical significance of BBT in enhancing dyspnea and QOL in COPD patients.

Table 3 BETWEEN GROUP COMPARISON – MBS

	Mean	Std. deviation	p-value		Mean	Std. deviation	p-value
Pre-treatment MBS (BBT)	6.7	1.55	0.231	Post-treatment MBS (BBT)	2.9	1.21	0.01
Pre-treatment MBS (ACBT)	7.3	1.56		Post-treatment MBS (ACBT)	3.9	1.36	

Table 4 BETWEEN GROUP COMPARISON – SGRQ

	Mean	Std. deviation	p-value		Mean	Std. deviation	p-value
Pre-treatment SGRQ (BBT)	71.5	8.44	0.97	Post-treatment SGRQ (BBT)	36.8	6.59	0.009
Pre-treatment SGRQ (ACBT)	71.6	8.46		Post-treatment SGRQ (ACBT)	42.55	6.61	

For Group B undergoing ACBT, the pre-treatment MBS score was 7.3 (\pm 1.56), which reduced to 3.95 (\pm 1.36) post-treatment. The SGRQ scores also showed a notable decrease from a pre-treatment average of 71.6 (\pm 8.46) to 42.55 (\pm 6.61) post-treatment. Similar to Group A, the p-value for both parameters was 0.000, indicating that ACBT is a statistically significant method for improving dyspnea and QOL in COPD patients.

A critical aspect of the study was the between-group comparison using an independent sample T-test. The comparison of pre- and post-treatment MBS scores between both groups revealed a pre-treatment p-value of 0.231 and a post-treatment p-value of 0.01. Since the significance level was set at $p < 0.05$, these results indicate a statistically significant difference between the two techniques, with BBT proving more effective than ACBT in ameliorating dyspnea in COPD patients. Additionally, the pre- and post-treatment SGRQ scores comparison yielded a pre-treatment p-value of 0.97 and a post-treatment p-value of 0.009, reinforcing the superiority of BBT over ACBT in enhancing the QOL of COPD patients.

DISCUSSION

The central focus of this study was to evaluate and compare the effectiveness of two breathing techniques, namely the Buteyko Breathing Technique (BBT) and the Active Cycle of Breathing Technique (ACBT), in ameliorating dyspnea and enhancing the overall quality of life (QOL) in patients with Chronic Obstructive Pulmonary Disease (COPD). Participants in both groups were administered standard treatment comprising bronchodilators and inhaled corticosteroids, supplemented by either BBT or ACBT for six weeks. The findings from this research underscored the beneficial impact of both techniques on COPD symptoms, with BBT exhibiting a more pronounced effect in improving dyspnea and QOL. This aligns with the hypothesis that non-pharmacological interventions can play a significant role in managing COPD symptoms (27, 28).

The superior performance of Buteyko breathing in this study could be attributed to its focus on reducing hyperventilation and boosting carbon dioxide levels, thereby rectifying improper breathing patterns prevalent in COPD patients. The technique's emphasis on diaphragmatic breathing and controlled breaths has been shown to effectively reduce dyspnea and enhance QOL, as corroborated by Ragab and Muhammad's research (28). This finding is particularly relevant considering the prevalence of dysfunctional breathing patterns in COPD patients, which are more common than in other respiratory conditions like asthma (29). By addressing these patterns, Buteyko breathing not only improves physical functioning but also positively affects emotional well-being and social interactions, which are critical components of QOL as measured by the St. George's Respiratory Questionnaire (30).

The simplicity and accessibility of Buteyko breathing are also noteworthy. Its ease of learning and practice, without the need for specialized equipment, renders it a viable and cost-effective method, particularly beneficial for COPD patients with limited access to comprehensive healthcare resources (31). While BBT demonstrated significant efficacy, it's important to recognize the effectiveness of ACBT in improving dyspnea and QOL. ACBT, focusing on airway clearance, has been noted for its benefits in sputum clearance and lung function improvement, as evident in other studies (16). However, the effectiveness of these techniques can vary among individuals, influenced by factors like disease severity, patient preferences, and comorbidities (32). Hence, a personalized treatment approach, considering these factors, is crucial for optimal COPD management. This study, while highlighting the advantages of Buteyko breathing, does not undermine the value of ACBT but rather supports the notion that the choice of technique should be tailored to the patient's specific needs and circumstances.

Reflecting on the study's strengths, the randomized design and the use of validated measurement tools (MBS and SGRQ) add credibility to the findings. However, limitations include a relatively small sample size and the study's restriction to a single center, which may affect the generalizability of the results. Future research should consider a larger, more diverse cohort and potentially include a longitudinal follow-up to assess the long-term impacts of these interventions. While both Buteyko and Active Cycle of Breathing Techniques were effective in improving dyspnea and QOL in COPD patients, the Buteyko technique demonstrated greater efficacy. These findings underscore the importance of incorporating non-pharmacological interventions in COPD management, tailored to individual patient needs to optimize outcomes.

CONCLUSION

In conclusion, this study elucidates the efficacy of the Buteyko Breathing Technique (BBT) and the Active Cycle of Breathing Technique (ACBT) in managing dyspnea and improving the quality of life (QOL) in patients with Chronic Obstructive Pulmonary Disease (COPD). While both techniques proved beneficial, BBT demonstrated superior effectiveness compared to ACBT. These findings carry significant implications for clinical practice, highlighting the importance of integrating non-pharmacological interventions into COPD management strategies. Given the ease of implementation and cost-effectiveness of Buteyko breathing, it emerges as a particularly valuable option, especially for patients with limited access to specialized healthcare. This study advocates for a more holistic approach in treating COPD, where personalized breathing techniques are employed alongside conventional pharmacological treatments to optimize patient outcomes. The results reinforce the need for healthcare professionals to consider patient-specific factors such as disease severity and personal preferences in developing comprehensive management plans. Further research, particularly with larger and more diverse cohorts, is recommended to validate these findings and explore the long-term effects of these breathing techniques in the management of COPD.

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