

# Effectiveness of Active Cycle Breathing Techniques versus Postural Drainage with Chest Physiotherapy for subjects with COPD

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## Abstract-

**BACKGROUND:** Chronic obstructive pulmonary disease (COPD) is a multifaceted illness involving more than just airflow blockage. It is a global health concern, with cigarette smoking being a major risk factor across the board. Active cycle of breathing technique (ACBT) is an airway clearance approach that includes breath control, thoracic expansion exercises, with forceful expiration. Chest physiotherapy has been suggested to be useful for patients with chronic obstructive pulmonary disease (COPD) due to therapeutic effects.

**METHODS:** 20 subjects were selected based on Inclusion and Exclusion criteria. 10 subjects for Experimental group (Group A), they were given ACBT. The Control group (Group B) consisting of 10 subjects, were given Postural drainage with Chest physiotherapy. The CAT scale, Pulse Oximeter and Sputum weight (ml) were used as outcome measures.

**RESULT:** Statistical analysis of post test for CAT scale, pulse oximeter, Sputum weight (ml) revealed that there was a significant difference seen in Active cycle of breathing technique when compared to postural drainage with Chest physiotherapy.

**DISCUSSION:** The goal of the study is to determine the most efficient method of treating COPD in terms of clearing the airways utilising the ACBT, postural drainage with chest physiotherapy. Beneficial effects were significantly greater in Active cycle of breathing technique when compared to postural drainage with chest physiotherapy.

**CONCLUSION:** According to the findings of this study, ACBT in the experimental group is much more effective when compared to control group postural drainage with chest physiotherapy in sputum output and airway clearance for COPD patients.

**Keywords:** ACBT, CAT Scale, COPD, Postural Drainage with Chest Physiotherapy, Pulse oximeter, Sputum weight(ml).

## INTRODUCTION:

Chronic obstructive pulmonary disease (COPD) is a multifaceted illness involving more than just airflow blockage. <sup>1</sup>COPD is defined in a variety of ways, with the most precise criteria relying on a physician's exact diagnosis. <sup>2</sup>The impact of airflow blockage on heart function and gas exchange are significant, with systemic ramifications. <sup>1</sup>It affects roughly 10% of the adult population, and by 2020, it is expected to be the world's third leading cause of death and disability. <sup>3,4</sup>COPD is one of the primary causes of illness and death throughout the world, with an estimated 80 million individuals suffering from mild to severe COPD. <sup>5</sup>It is a global health concern, with cigarette smoking being a major risk factor across the board; additional risks include outdoor and indoor pollution of air, occupational dangers, and infections. The disorder's prevalence estimates show a lot of variation between groups, implying that risk factors might have different effects on different people. <sup>6</sup>

For those with chronic lung illness who have abundant secretions, the ACBT is often utilized to facilitate airway clearance. <sup>7</sup>In individuals with COPD, the degree of evidence for ACBT is grade B. <sup>8</sup>ACBT is an airway clearance approach that includes breath control, thoracic expansion exercises, with forceful expiration. <sup>9</sup>The ACBT consists of a cycle of thoracic expansion exercises alternated with breathing control, followed by an forced expiratory technique with an open glottis and breathing control. <sup>10,26</sup>The elements of ACBT include 10–15 seconds of controlled breathing followed by Thoracic Expansion exercises (Exercises for deep breathing that emphasise holding the inhalation for three seconds before the exhalation), and forceful expiration (three huffs) in a defined set cycle. <sup>11</sup>

In illness characterized by high tracheobronchial secretions, postural drainage improves mucociliary clearance and yields bigger sputum volumes than a comparable control period. Only individuals with significant sputum quantities will benefit from postural drainage, percussion, and vibration therapy. <sup>12</sup>Individuals with profuse secretions are thought to benefit the most from chest physiotherapy, whereas patients with sparse secretions are thought to benefit the least. <sup>13</sup>

Manual chest physiotherapy (MCP) comprises external thoracic manipulation utilizing percussion and vibration methods. <sup>14</sup>Sputum clearance increased significantly after 60 minutes of mechanical vibration therapy. <sup>15</sup>But 60 minutes after treatment, with the quick manual percussion resulted in increased production of the sputum volume than mechanical vibration therapy. <sup>16</sup>Chest physiotherapy has been suggested to be useful for patients with COPD due to therapeutic effects largely connected to hyperemia and lymphatic system activation. <sup>17</sup>

Coughing, sputum production, and a steady worsening of breathlessness are all symptoms. Entrapment of air with greater hyperinflation occur during functional actions including such as walking or stairs climbing, aggravates dyspnea. <sup>18</sup>This

increasing breathlessness triggers stress, which in turn triggers greater breathlessness, setting off a vicious reaction during which physical activities are ignored.<sup>19</sup> Difficulties in respiratory as well as peripheral muscle function with mass are common systemic manifestations of COPD associated to higher mortality.<sup>20</sup>

This disorder's prevalence rate reveals significant variation among populations, implying that risk factors might impact people differently. COPD will become more prevalent in the coming years as the world population ages.<sup>6</sup> In most research, people aged 35–40 years old had a prevalence around 10–15 percent.<sup>21</sup> Although it was previously believed that COPD mostly affected elderly, male smokers, women are also experiencing the disease at considerably higher rates. According to recent studies, the prevalence as well as mortality rate of COPD have risen faster in women when compared to males.<sup>22,23</sup> Other considerations include tobacco susceptibility, anatomical and hormonal abnormalities, and behavior variances in responsiveness to existing therapy techniques.<sup>24</sup> Spirometry is used to diagnose the disease. COPD has no cure at the moment, but existing treatments can help with symptoms, life quality, and preventing the condition from deteriorating.<sup>25</sup>

**METHODS:**

Research participants who expressed a willingness to participate were screened for inclusion and exclusion criteria. For the experimental group (Group A), which consists of a total of 20 individuals, ACBT is administered to 10 of the subjects. Postural drainage and chest physiotherapy are provided to the control group (Group B), which consists of 10 participants. The CAT scale, Pulse Oximeter and Sputum weight (ml) were used as outcome measures.

CAT Scale was used to assess the quality of life, Pulse Oximeter was used to assess the oxygen saturation level Sputum weight (ml) was used to assess the sputum output of the subject

**Experimental Group (GROUP A)**

The experimental group practised the active cycle of breathing method for 4 weeks, 2 sets each day, 30 repetitions total. Breath control, deep breathing exercises (also known as thoracic expansion exercises), and huffing (also known as forced expiratory technique, or FET) are all part of the cycle of breathing methods known as ACBT. After each treatment, the patient is allowed to relax. CAT scale, pulse oximeter, and sputum weight (ml) post-test readings are collected, tabulated, and statistically analysed for outcomes after 4 weeks have passed.

**Control Group (GROUP B)**

The control group was given postural drainage with Chest Physiotherapy (percussion, vibration, and shaking) for Over the course of 4 weeks, 2 sets were completed each day for 3 days. After each treatment, the patient is allowed to relax. At the end of 4 weeks, the post-test value will be measured on the COPD assessment test scale, the pulse oximeter, and sputum weight (mL), which are then taken down, tabulated, and statistically evaluated for results.

**STATISTICAL ANALYSIS**

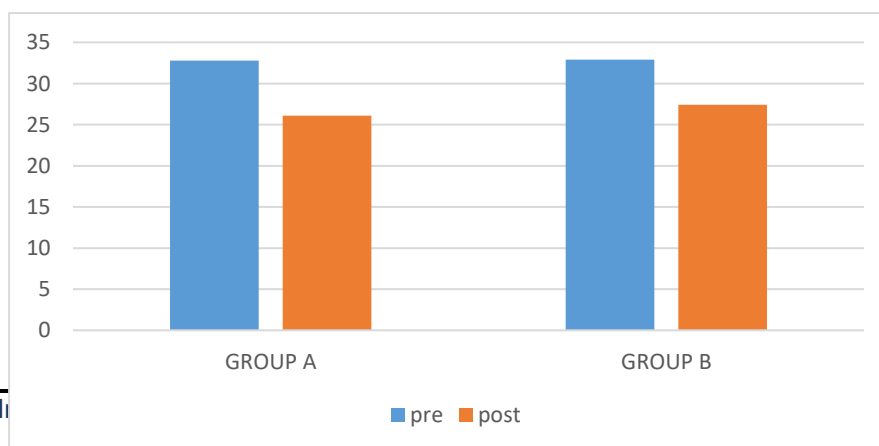
A paired t-test was used to see whether there was any variation between pre- and post-experiment. Independent sample t-testing was used to see whether there was any variation between the two groups.

**RESULT AND STATISTICAL ANALYSIS:**

**Table-1: Pre and post values of CAT Scale in group A and B**

CAT Scale		MEAN	SD	T value	P value
GROUP A	PRE TEST	32.80	3.05	5.5219	<0.0001
	POST TEST	26.10	2.33		
GROUP B	PRE TEST	32.90	2.73	4.8593	
	POST TEST	27.40	2.32		

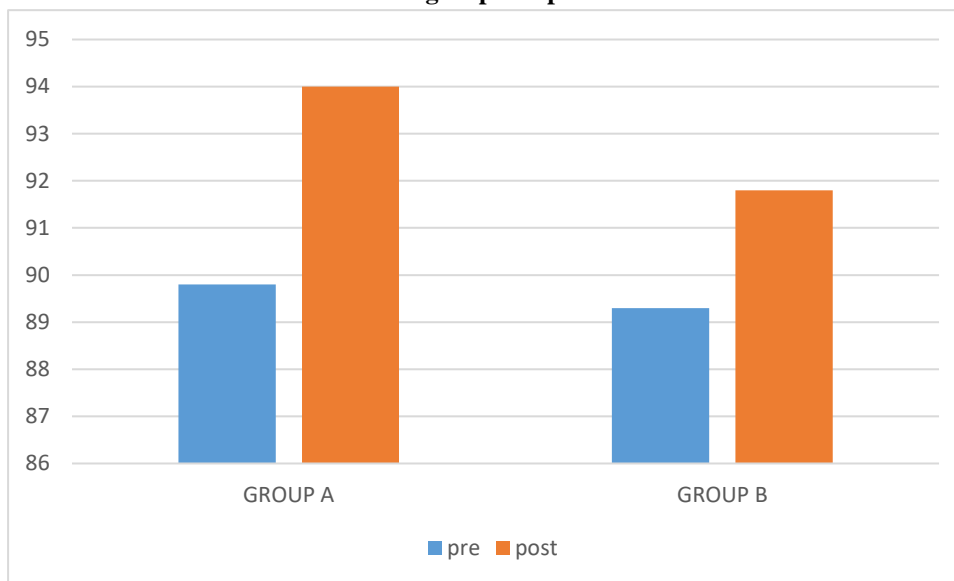
**GRAPH 1: Between group comparison of CAT Scale**



**Table 2: Pre and Post values of Pulse Oximeter in group A and B**

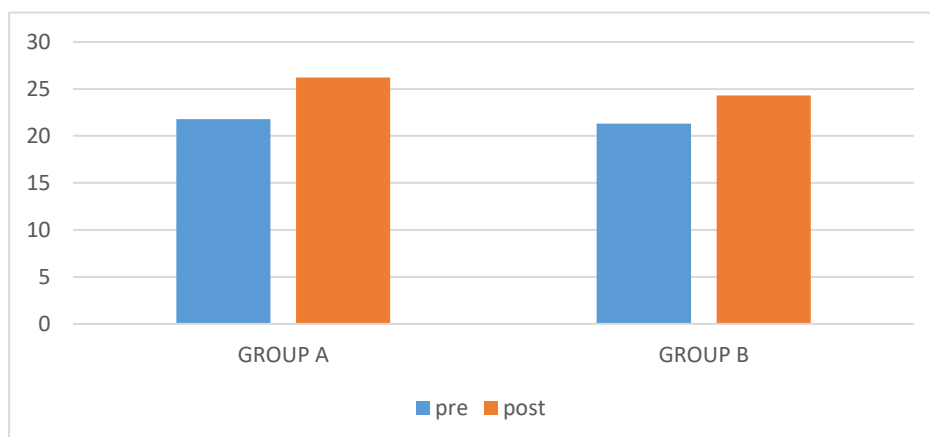
Pulse Oximeter		MEAN	SD	T value	P value
GROUP A	PRE TEST	89.80	1.75	5.3436	<0.0001
	POST TEST	94.00	1.76		
GROUP B	PRE TEST	89.30	1.16	5.0913	
	POST TEST	91.80	1.03		

**GRAPH 2: Between group comparison of Pulse oximeter**



**Table 3: Pre and Post values of Sputum weight (ml) in group A and B**

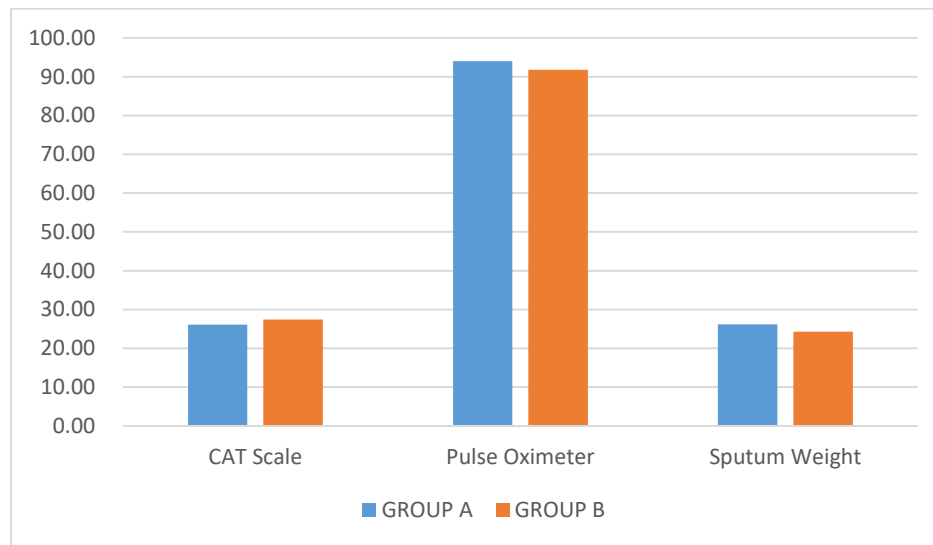
Sputum weight (ml)		MEAN	SD	T value	P value
GROUP A	PRE TEST	21.80	1.93	5.9510	<0.0001
	POST TEST	26.20	1.32		
GROUP B	PRE TEST	21.30	1.34	5.0155	
	POST TEST	24.30	1.34		



**GRAPH 3: Between group comparison of sputum weight (ml)**

**Table 4: Comparison between the Post Test Values of CAT scale, Pulse Oximeter and Sputum weight (ml).**

Parameters	Experimental group	Control group	T-value	P-value
CAT scale	26.10	27.40	1.2503	<0.0001
Pulse Oximeter	94.0	91.80	3.4037	
Sputum weight (ml)	26.20	24.30	3.2014	

**GRAPH 4: Between the Post mean value of CAT scale, Pulse Oximeter and Sputum weight (ml).**

## RESULT

Descriptive statistics were used to tabulate and analyze the acquired data. A statistical comparison of the data between the experimental group and the control group showed a significant difference in the value. The experimental group's post-test mean CAT Scale score was 26.10, whereas the control group's was 27.40. This demonstrates that experimental group CAT scale levels are considerably lower than control group values. In the experimental group, the post mean result for the pulse oximeter was 94.00, whereas it was 91.80 in the control group. This demonstrates that the pulse oximeter values in the experimental group were greater than those in the control group. The post mean value for Sputum weight (ml) was 26.20 and in control group was 24.30. This shows that Sputum weight (ml) values in experimental group is comparatively higher than control group. The Result of the post test on the CAT Scale, Pulse Oximeter and sputum weight(ml) were statistically significant when compared to the control group.

## DISCUSSION

The goal of the study is to determine the most efficient method of treating COPD in terms of clearing the airways utilising the ACBT, postural drainage with chest physiotherapy. With a 4 weeks time frame, this comparison is shown. The CAT Scale Pulse Oximeter, and Sputum Weight (ml) were used to examine patients both before and after therapy. Beneficial effects were significantly greater in Active cycle of breathing technique when compared to postural drainage with chest physiotherapy. The study population consisted of 20 patients between 40 - 60 years of age.

There isn't enough solid evidence in the literature, as stated by Polastri M et al (2019), to support the utilisation of manual massage in COPD patients. Rather, it is recommended as a therapeutic approach when used in conjunction with other treatments like physical activity. Muscle relaxation, which may be attained by gliding, kneading, and friction methods, is frequently linked to the advantages of manual massage on soft tissues. Mucus can be removed simultaneously with the use of percussions, vibration, and shaking on the chest. Depending on the subset of people being investigated, a method's efficacy may vary.<sup>17</sup>

When compared to RIM and PEP, there was no clear indication that the sputum wet weight had improved in the short term. There is little proof that the majority of research participants favour other therapy modalities over FET/ACBT.<sup>7</sup> Despite the overwhelming number of patients re+porting comfort while performing ACBT, the VAS score comparison for comfort revealed a substantial difference. In the removal of bronchiectasis airways, ACBT has been demonstrated to be just as successful as conventional chest physical therapy, and patients report that ACBT is more pleasant.<sup>11</sup>

The final CAT is made up of eight questions, each of which is formatted as a semantic six-point difference scale. This makes the instrument simple to use and simple for patients to complete. It is evident that the CAT has discriminative features that are very comparable to those of the considerably more complicated SGRQ-C, demonstrating that it will be able to assess the effects of COPD on each patient's health. Its purpose is to enhance the data from assessments of exacerbation risk and lung function.<sup>5</sup>

The effectiveness of percussion and drainage in promoting expectorated sputum is confirmed by the results, which extend this observation to adult patients with chronic bronchitis; It is unclear if the patient will benefit from this.<sup>27</sup> The study found that while both postural drainage and ACBT significantly improved pulmonary function in bronchiectasis and cleared the airways, ACBT had a superior impact on FVC, FEV1, and SPO2 than postural drainage did.<sup>10</sup> Few other authors also done similar research related to my claim and has proven to be right with the treatment of ACBT in the management of COPD in comparison with the other modes of interventions. From the above statistical analysis of the ACBT and postural drainage given to the patient, it has been clearly shown that the ACBT is more effective.

## CONCLUSION

According to the findings of this study, Active Cycle of Breathing Technique in the experimental group is much more effective when compared to control group's postural drainage with chest physiotherapy in sputum output and airway clearance for COPD patients.

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## REFERENCES:

1. Barnes PJ, Celli BR. Systemic manifestations and comorbidities of COPD. *European respiratory journal*. 2009 May 1;33(5):1165-85.
2. Mannino DM. COPD: epidemiology, prevalence, morbidity and mortality, and disease heterogeneity. *Chest*. 2002 May 1;121(5):121S-6S.
3. Buist AS, McBurnie MA, Vollmer WM, Gillespie S, Burney P, Mannino DM, Menezes AM, Sullivan SD, Lee TA, Weiss KB, Jensen RL. International variation in the prevalence of COPD (the BOLD Study): a population-based prevalence study. *The Lancet*. 2007 Sep 1;370(9589):741-50.
4. Lopez, A D, and C C Murray. "The global burden of disease, 1990-2020." *Nature medicine* vol. 4,11 (1998): 1241-3.
5. Jones PW, Harding G, Berry P, Wiklund I, Chen WH, Leidy NK. Development and first validation of the COPD Assessment Test. *European Respiratory Journal*. 2009 Sep 1;34(3):648-54.
6. Mannino DM, Buist AS. Global burden of COPD: risk factors, prevalence, and future trends. *The Lancet*. 2007 Sep 1;370(9589):765-73.
7. Lewis LK, Williams MT, Olds TS. The active cycle of breathing technique: a systematic review and meta-analysis. *Respiratory medicine*. 2012 Feb 1;106(2):155-72.
8. Cabillic M, Gouilly P, Reyhler G. [Manual airway clearance techniques in adults and adolescents: what level of evidence?]. *Rev Mal Respir* 2016;35:495–520
9. Üzmezoglu B, Altay G, Özdemir L, Tuna H, Süt N. The Efficacy of Flutter® and Active Cycle of Breathing Techniques in Patients with Bronchiectasis: A Prospective, Randomized, Comparative Study. *Turk Thorac J* 2018;19:103–9.
10. Elsayed SH, Basset WK, Fathy KA. Impact of active cycle of breathing technique on functional capacity in patient with bronchiectasis. *International Journal of Therapies and Rehabilitation Research*. 2015;4(5):287.
11. Nafeez S, Arun G, Maiya & Siva KT. Active cycle of breathing technique versus conventional chest physical therapy on airway cleanse in bronchiectasis. *Advances in Physiotherapy*. 2009;11:193-98. Sutton, P P et al. "Chest physiotherapy: a review." *European journal of respiratory diseases* vol. 63,3 (1982): 188-201.
12. Mazzocco MC, Owens GR, Gonzales-Camid F, Warda M, Kirilloff LH, Rogers RM. Chest percussion and postural drainage in patients with bronchiectasis. *Chest*. 1985 Sep 1;88(3):360-3.
13. Cross J. Chest physiotherapy during an acute exacerbation of chronic obstructive pulmonary disease. *Chronic Respiratory Disease*. 2012 May;9(2):73-5.
14. Brown, PM, Manfreda, J, McCarthy, DS, MacDonald, S. The effect of mechanical vibration in patients with acute exacerbations of chronic obstructive pulmonary disease. *Physiother Can* 1987; 39: 371–374
15. Gallon, A. Evaluation of chest percussion in the treatment of patients with copious sputum production. *Resp Med* 1991; 85: 45–51
16. Polastri M, Clini EM, Nava S, Ambrosino N. Manual massage therapy for patients with COPD: A scoping review. *Medicina*. 2019 May;55(5):151.

17. Khachi H, Barnes N, Antoniou S. COPD: clinical features and diagnosis. *Clinical focus*. 2010 Dec 1.
18. O'Donnell, Denis E et al. "Canadian Thoracic Society recommendations for management of chronic obstructive pulmonary disease - 2007 update." *Canadian respiratory journal* vol. 14 Suppl B, Suppl B (2007): 5B-32B.
19. Barreiro, Esther, and Joaquim Gea. "Respiratory and Limb Muscle Dysfunction in COPD." *COPD* vol. 12,4 (2015): 413-26.
20. Rabe KF, Hurd S, Anzueto A, Barnes PJ, Buist SA, Calverley P, Fukuchi Y, Jenkins C, Rodriguez-Roisin R, Van Weel C, Zielinski J. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: GOLD executive summary. *American journal of respiratory and critical care medicine*. 2007 Sep 15;176(6):532-55.
21. Aryal S, Diaz-Guzman E, Mannino DM. Influence of sex on chronic obstructive pulmonary disease risk and treatment outcomes. *Int J Chron Obstruct Pulmon Dis*. 2014;9:1145–1154.
22. Sorheim IC, Johannessen A, Gulsvik A, Bakke PS, Silverman EK, DeMeo DL. Gender differences in COPD: are women more susceptible to smoking effects than men? *Thorax*. 2010;65:480–485.
23. Buist AS, Vollmer WM, Sullivan SD, et al. The Burden of Obstructive Lung Disease Initiative (BOLD): rationale and design. *COPD*. 2005;2:277–283.
24. McCarthy B, Casey D, Devane D, Murphy K, Murphy E, Lacasse Y. Pulmonary rehabilitation for chronic obstructive pulmonary disease. *Cochrane Database Syst Rev*. 2015;(2):
25. Yohannes AM, Connolly MJ. A national survey: percussion, vibration, shaking and active cycle breathing techniques used in patients with acute exacerbations of chronic obstructive pulmonary disease. *Physiotherapy*. 2007 Jun 1;93(2):110-3.
26. May, D B, and P W Munt. "Physiologic effects of chest percussion and postural drainage in patients with stable chronic bronchitis." *Chest* vol. 75,1 (1979): 29-32.