# Original Article

### Effect of Active Cycle of Breathing Technique in Adult Asthmatic Patients in Pakistan

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## **Abstract**

Asthma is one of the chronic and long-term diseases of the airways. It is characterized by reversible airflow obstruction, chest tightness, and dyspnea with decreased work of breathing. The inside airway's walls are swollen or inflamed. The aim of this study was to determine the effectiveness of active cycle of breathing technique as an airway clearance technique in patients with asthma. The health-related quality of life and functional capacity of patients was measured using a standardized airway questionnaire (AQ20) and six-minute walk test. The study was cohort design included 38 patients (mean age 41.131±14.711) of both genders with mild to moderate asthma. Each patient received multiple sessions (3times/week for one month) of active cycle of breathing technique. Pre and post-treatment measures were recorded for functional capacity and health-related quality of life in the form of six-minute walk test and standardized airway questionnaire. All 38 patients were stable during the study period. The health-related quality of life and functional capacity of patient significantly improved post-treatment sessions with means [205.375±93.594 for week 1, 1248.719±112.187 for week 2, 306.429±140.5554 for week 3, 337.245±134.389 for week 4], for six-minute wall test and mean difference 4.13± 2.3SD for standardized airway questionnaire with p-value (0.00) significant upon paired t-test. It is concluded that the active cycle of breathing technique is very beneficial intervention for improving quality of life and functional capacity of patients with mild to moderate asthma. Further, investigations are required to explore efficiency of ABCT as a tool for cardio-pulmonary rehabilitation.

**Keywords:** Bronchial asthma, active cycle of breathing technique (ACBT), health-related quality of life (QOL), functional capacity, airway questionnaire 20 (AQ20), Pakistan

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#### Introduction

Asthma is a serious health problem affecting about 300 million people of all ages throughout the world [1]. The heterogeneity of asthma depends on the geographical differences of gene and environmental interactions. Paroxysmal attacks of breathlessness, chest tightness and wheezing resulting from paroxysmal narrowing of bronchial airways are the characters of this disease. Inflammatory reaction within the bronchial walls causes muscle spasm, mucosal swelling and viscous bronchial secretion resulting in narrowing of airways [2,3]. However, the severity of disease and pathophysiology of the disease depends upon environmental exposure, health care access, care received, psychological factors and response to treatment [4]. Broadly asthma is classified as Early-onset and late-onset asthma. Early onset asthma occurs in childhood due to the formation of IgE antibodies in response to allergens present in the environment. While in late-onset asthma, external allergens play no role in the pathophysiology of the disease [5]. It has been hypothesized that exposure to cold, exercise, air pollution, aspirin and emotional stress stimulate cholinergic and alpha-adrenergic system resulting in bronchial constriction and increased bronchial secretions. Pharmacological therapy consists of inhaled short-acting beta-2 agonists, and inhaled steroids are effective in alleviating symptoms of asthma [6].

There is a rising interest in a non-pharmacological intervention of asthma [3,7]. Many people try to use breathing exercises to cope up with asthmatic attacks. Among non-pharmacological interventions in asthma are breathing exercises, quitting smoking, dieting, avoiding allergens and complementary medicine [8]. Physiotherapy interventions play an important role in the non-medicated treatment of asthma. Active cycle of breathing technique (ACBT) is one of the methods in pulmonary rehabilitation that has been adapted for asthmatic patients. ACBT aims at the clearance of airways in pulmonary patients [9]. The ACBT and forced expiratory technique are used for airway clearance with chronic lung disease. The excessive production of secretion in asthmatic patients leads to airway obstruction and sputum retention. These techniques help to decrease the frequency of infection and protect further airway damage [10].

The intervention works by clearing the secretions and preventing bronchospasm thus reducing the progression of airway disease and its associated symptoms. Thus ACBT in this way improves health-related quality of life and increases the functional capacity of patients [11,12]. ACBT includes chest expansion exercises, breathing control exercises and forced expiratory technique. The repetitions of each component of ACBT can be varied, but it is important that each element of ACBT must be present [13]. The aim of the study was to see the effect of ACBT by evaluating health-related quality of life and functional capacity of adult asthmatic patients.

The chronic obstructive pulmonary disorders (COPD) can cause severe complications as the

disease progresses. There are several methods to measure functional capacity in these patients and six-minute walk test is commonly used among them. Six-minute walk test has three main outcomes walking distance, O<sub>2</sub> destruction, and perceived exertion, assessed by Borg scale to measure functional capacity of disease <sup>[14]</sup>. The six-minute test is most commonly used the test to assess cardiac or functional exercise capacity during cardiac rehabilitation <sup>[15]</sup>. It is the most reliable tool to examine functional rehabilitation status of patients with chronic cardio-pulmonary illness <sup>[16]</sup>. This test is mostly conducted indoor and private environment without any distraction so that that patient can cover maximum distance in six minutes

#### **Material and Methods**

The study was conducted in the outdoor and indoor department of pulmonology at Jinnah Hospital Lahore, Pakistan. The study included total of 38 patients with mild to moderate asthma. Adult patients age between 18-60 years, with a clinical diagnosis of atopic asthma [FEV1 and FEV1/FVC greater than 75%]. Patients who were mechanically with comorbid conditions ventilated hypertension, heart diseases, intermittent claudication or any accompanied rib fracture and congenital ribcage deformities were excluded. The patients were given a consent form to participate in this study after ethical approval from ethical committee Jinnah Hospital, Lahore. Moderate asthma was defined as forced expiratory volume 1 (FEV1) and forced vital capacity greater than 75%. Functional abilities referred to the capability of an asthmatic patient to carry out activities of daily living without alleviation of symptoms [18]. The basic interventions to assess functional lung capacity and treat patients with asthma were active cycle of breathing (ACBT) along with six-minute walk test and airway questionnaire (AQ). Reported data suggest that active cycle of breathing technique is basically used to clear airways and mobilize pulmonary excess secretions from lung [15]. It is consist of following steps, thoracic expansion, breathing control exercises followed by forced expiratory technique with an open glottis and control breathing [19].

The intervention (ACBT) had been given to each patient according to standard protocol. The treatment included a session of about twenty-five minutes that consisted of chest expansion exercises, breathing control techniques and forced expiratory technique. Each patient received multiple sessions (3times/week for one month) of active cycle of breathing technique. To determine the effect of the intervention (ACBT); functional capacity of lungs and health-related quality of life were measured. It is observed that the patients suffering from asthma and chronic obstructive pulmonary disease usually have poor quality of life and the airway questionnaire 20 (AQ20) was developed to asses QOL [20]. The questionnaire consists of total 20 items with scoring range from 0-20 and high score indicates poor quality of life. To measure the health-related quality of life in this study, a

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standardized airway questionnaire (AQ20) was used [21]. The patient filled the questionnaire on the day one first session, and on the last day of the last session after four weeks.

The six-minute walk test was conducted according to standard protocol and in temperature controlled environment. Patients were instructed to walk in 30 meters marked corridor with starting point and finishing line. Patients were advised to stop in emergency situations, like chest pain, chest tightness, dyspnea and calf cramps [22]. The sixminute walk test (6MWT) was used as a measurement tool to test the functional capacity of the patient [23]. The test was performed by the patient twice during each session, pretreatment and posttreatment distance was recorded in meters. The analysis of the study was done by using SPSS for Windows version 16. The comparison pretreatment and posttreatment levels were done using the paired t-test. The results presented as the mean  $\pm$  standard deviation (SD). Statistical significance was considered at P<0.05, with 95% confidence interval.

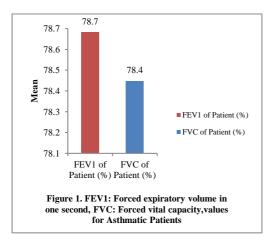
#### Results

The study included 38 adult asthmatic patients out of which 19 were males, and 19 were females. The patients were treated with active cycle of breathing technique (ACBT) as an adjunct treatment. The age of patients was between 18-60 years. The mean age of asthmatic patients is showed in table 1.

Table 1. Age of Patients (years)

N	Mean	Std. Deviation	Minimum	Maximum	
38	41.1316	14.71196	18.00	60.00	

The table showed that mean age of subjects was 41.131±14.711. The patient's functional capacity was measure to define mild to moderate asthma, the value of forced vital capacity (FVC) along with forced expiratory volume (FEV1) are shown in figure 1.



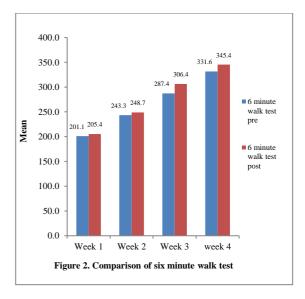
Further results showed that the quality of life of asthmatic patient was significantly improved and paired t-test results are listed in table 2.

**Table 2.** Comparison of pretreatment and post treatment AQ20 score

	Mean	SD	Std. Error mean	95% CI	t	Df	Sig. (2-tail)
AQ20 score for pre and post treatment	4.31	2.3	.38	3.5-5.0	11.3	37	.000

The table above shows pretreatment and a posttreatment score of AQ 20. The result shows that p-value for comparison of AQ20 score is 0.000. The result indicates significant improvement in posttreatment health-related quality of life.

The interventions of active cycle of breathing technique employed to asthmatic patient were also assessed by six-minute walk test. The pre and post value of six-minute walk test for each week (4weeks for one month) is elaborated in figure 2.



The table shows that means for posttreatment 6MWT were  $205.4\pm93.6$  for week 1,  $248.7\pm112.9$  for week 2,  $306.4\pm140.6$  for week 3,  $345.4\pm134.4$  for week 4. The result showed improvement in the distances walked by patients during their four-week treatment.

#### **Discussion:**

Pulmonary disorders are becoming an important cause of morbidity and mortality in Pakistan. The most common among them are chronic obstructive pulmonary diseases, bronchiectasis, and asthma rising worldwide  $^{[24]}$ . The present study was aimed to determine the effects of active cycle of breathing technique in mild to moderate asthmatic patients in Pakistan. The study was assessed by airway questionnaire 20 (AQ20) and six-minute walk test for both pre and post-treatment phases. A total of thirty-eight patients who had mild to moderate asthma were treated with active cycle of breathing technique (3times/week for one month) in improving the health-related quality of life and functional capacity. The analysis of results showed that there is a significant improvement in the score of airway questionnaire and six-minute walk test.

Many studies agreed with results of this study and reported improvement in six-minute walk with functional capacity. Comparative study done on patients with cystic fibrosis found active cycle of breathing technique as effective as postural drainage. The increase in functional capacity was observed after ACBT interventions [25]. A study conducted on patient with bronchiectasis also reported similar effectiveness of postural drainage and ACBT equally [26].

The efficacy of ACBT has been reported in comparative studies. A research compared the efficacy of conventional treatment with active cycle of breathing technique in patients with bronchiectasis with variable etiology [27]. The results of this study were not like those reported by other researcher, where ACBT was reported to be more effective that conventional physiotherapy for expectoration of sputum in bronchiectasis patients [28]

Beside active cycle of breathing technique many other physiotherapy interventions are reported and used for pulmonary rehabilitation. To expectorate excess pulmonary secretions, and increase pulmonary functional capacity devices and coughing are being used. A device called Capella is also an effective method to expectorate sputum and airway clearance and as efficient as ACBT in patients with bronchiectasis and COPD [29]. There are other studies that compared active cycle of breathing technique with autogenic drainage but there few evidences which prefer ACBT over any other airway clearance technique. The analysis of means of distance walked among groups in meters showed significant improvement. The posttreatment mean of six-minute walk test for week one was 205.37±93.59 while the posttreatment mean of sixminute walk test for week four was 337.24±134.38. So there is an improvement in the score of sixminute walk test. Hence there is a significant improvement in the functional capacity of patients during a first, second and fourth week of treatment session. This study used only two measurement tools such as airway questionnaire (AQ 20) and sixminute walk test (6MWT).

Further, studies can be done with other parameters like Borge scale, SF-36, AQLQ score, asthma control questionnaire. The results of this study also have got strong evidence from another study that included a comparison of active cycle of breathing technique and diaphragmatic breathing in patients with chronic obstructive pulmonary disease (COPD). The effectiveness of the intervention was measured through improvement in FEV1/FVC, FEV1, FVC and modified Borg scale. This study showed that there was an equal level of improvement in FEV1, FVC and modified Borg scale values. But FEV1/FVC levels have shown more improvement in a group of patients receiving active cycle of breathing technique than those who were performing the diaphragmatic technique with postural technique [30]. A systematic review found the evidence for the effectiveness of active cycle of breathing technique in patients with chronic obstructive pulmonary disease and cystic fibrosis. Most comparators were conventional chest physiotherapy, positive expiratory pressure, and control. Sputum net weight and forced expiratory volume were assessed. The results showed increased sputum production during and up to one hour post-ACBT in comparison with conventional chest physiotherapy [7].

#### Conclusion

This study concludes that the active cycle of breathing technique (ACBT) is very beneficial as an adjunct treatment for improving health-related quality of life and functional capacity of asthmatic patients in Pakistan. Recommendations are ACBT can be useful during cardio-pulmonary rehabilitations and further studies are needed to elucidate the efficiency of ACBT as a rehabilitation tool in different lung diseases.

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