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An Observational study of Active Cycle of Breathing Technique in Asthmatic Patients

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Abstract
Background: *Asthma is an inflammatory disease of the airways of the lungs. Symptoms include episodes of wheezing, coughing, chest tightness and shortness of breath. The inside walls of airways are swollen or inflamed.* ***Material and Method:*** *In this study, six patients were included of both genders with mild to moderate asthma and the mean age 40.020±13.600. Each patients received multiple sessions i.e. 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 six patients were stable during study period.* ***Results:*** *The health related quality of life and functional capacity of patient significantly improved post-treatment sessions with means [104.3±82.4 for first week, 137.6±111.8 for second week, 205.318±130.5 for third week, 234.3±123.3 for fourth week], The mean difference and six-minute wall test 3.12±1.2SD for standardized airway questionnaire with p-value [0.00] significant upon paired t-test.* ***Conclusion:*** *It is concluded that the active cycle of breathing technique is very beneficial for improving quality of life and functional capacity of patients with mild to moderate asthma.*

Keywords: *Active cycle of breathing technique, Asthma, functional capacity, health-related quality of life, airway.*

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I. INTRODUCTION

Asthma is a common long-term inflammatory disease of the airways of the lungs.[1] It is characterized by variable and recurring symptoms, reversible airflow obstruction, and easily triggered bronchospasms.[2][3] Symptoms include episodes of wheezing, coughing, chest tightness, and shortness of breath.[4] These may occur a few times a day or a few times per week.[3] Depending on the person, asthma symptoms may become worse at night or with exercise.[3]

Asthma is thought to be caused by a combination of genetic and environmental factors.[5] Environmental factors include exposure to air pollution and allergens.[3] Other potential triggers include medications such as aspirin and beta blockers.[3] Diagnosis is usually based on the pattern of symptoms, response to therapy over time, and spirometry lung function testing.[6] Asthma is classified according to the frequency of symptoms, forced expiratory volume in one second (FEV1), and peak expiratory flow rate.[7] It may also be classified as atopic or non-atopic, where atopy refers to a predisposition toward developing a type 1 hypersensitivity reaction.[8][9]

In 2015, 358 million people globally had asthma, up from 183 million in 1990.[10][11] It caused about 397,100 deaths in 2015,[12] most of which occurred in the developing world.[1] Asthma often begins in childhood, [1] and the rates have increased significantly since the 1960s.[13] Asthma was recognized as early as Ancient Egypt.[14] The word "asthma" is from the Greek ἅσθμα, *ásthma*, which means "panting".[15]

Asthma is characterized by recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing.[16] Sputum may be produced from the lung by coughing but is often hard to bring up.[17] During recovery from an asthma attack (exacerbation), it may appear pus-like due to high levels of white blood cells called eosinophils.[18] Symptoms are usually worse at night and in the early morning or in response to exercise or cold air.[19] Some people with asthma rarely experience symptoms, usually in response to triggers, whereas others may react frequently and readily and experience persistent symptoms. A number of other health conditions occur more frequently in people with asthma, including gastro-esophageal reflux disease (GERD), rhinosinusitis, and obstructive sleep apnea.[20] Psychological disorders are also more common,[21] with anxiety disorders occurring in between 16–52% and mood disorders in 14–41%.[22] It is not known whether asthma causes psychological problems or psychological problems lead to asthma.[23] Those with asthma, especially if it is poorly controlled, are at increased risk for radiocontrast reactions.[24] Cavities occur more often in people with asthma.[25] This may be related to the effect of beta 2 agonists decreasing saliva.[26]

Asthma is caused by a combination of complex and incompletely understood environmental and genetic interactions.[27] These influence both its severity and its responsiveness to treatment.[28] It is believed that the recent increased rates of asthma are due to changing epigenetic (heritable factors other than those related to the DNA sequence) and a changing living environment.[29] Asthma that starts before the age of 12 years old is more likely due to genetic influence, while onset after age 12 is more likely due to environmental influence.[30]

Many environmental factors have been associated with asthma's development and exacerbation, including, allergens, air pollution, and other environmental chemicals.[31] Smoking during pregnancy and after delivery is associated with a greater risk of asthma-like symptoms.[32] Low air quality from environmental factors such as traffic pollution or high ozone levels [33] has been associated with both asthma development and increased asthma severity.[34] Exposure to indoor volatile organic compounds may be a trigger for asthma; formaldehyde exposure, for example, has a positive association.[35] Phthalates in certain types of PVC are associated with asthma in both children and adults.[36][37] While exposure to pesticides is linked to the development of asthma, a cause and effect relationship has yet to be established.[38][39]

Asthma is associated with exposure to indoor allergens.[40] Common indoor allergens include dust mites, cockroaches, animal dander (fragments of fur or feathers), and mold.[41][42] Efforts to decrease dust mites have been found to be ineffective on symptoms in sensitized subjects.[43][44]

II. MATERIAL AND METHODS

In this study, total of six patients with mild to moderate asthma. The age of the patients is between 17-60 years. Moderate asthma was defined as forced expiratory volume 1 [FEV1] and forced vital capacity greater than 75%. Functional abilities referred to the capability of asthmatic patients to carry out activities of daily living without alleviation of symptoms. 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]. Active cycle breathing technique is used to clear airways and mobilize pulmonary excess secretions from lung. Its consist of thoracic expansion, breathing control exercises followed by forced expiratory technique with an open glottis and control breathing.

Active cycle breathing technique 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 exercises and forced expiratory technique. Each patient received multiple sessions three times/week for one month of active cycle of breathing technique. To determine the effect of active cycle breathing technique, functional capacity of lungs and health related quality of life and the airway questionnaire was developed to asses QOL. The questionnaire consists of total twenty 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 standardized airway questionnaire [AQ20] was used. [45] 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, dyspnoea, calf cramps. The six-minute walk test 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, pre-treatment and post-treatment distance was recorded in meters. The comparison pre-treatment and post-treatment levels were done using the paired t-test.

III. RESULTS

In this study, six adult asthmatic patients, three females and three were males. The patients were treated with active cycle breathing technique as treatment. The age of patients was between 17-60 years.

Total patients: 6
Mean: 40.020
Standard Deviation: 13.600
Minimum Age: 17
Maximum Age: 60

It showed that mean age of patients was 40.020±13.600. 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 67.6 and 67.3 respectively. Further results showed that the quality of life of asthmatic patient was significantly improved and paired t-test results. Comparison of pre-treatment and post-treatment AQ20 scores:

	Mean	SD	Std. Error mean	95%CI	T	Df	Sig. [2-tail]
AQ20 score for pre and post treatment	3.20	1.2	.27	2.4.4.0	10.2	36	.000

This table shows pre-treatment and post-treatment score of AQ20. The result shows that p-value for comparison of AQ20vscore is 0.000. The result indicates significant improvement in post-treatment health-related quality of life. Active cycle breathing techniques employed to asthmatic patient were also assessed by six-minute walk test. The pre and post value of six-minute walk test for four weeks in one month is discussed below:

Comparison of six minute walk test	**Week 1**		**Week 2**		**Week 3**		**Week 4**	
	Pre-test	**Post-test**	**Pre-test**	**Post-test**	**Pre-test**	**Post-test**	**Pre-test**	**Post-test**
	100.0	104.3	132.2	137.6	176.3	205.3	220.5	234.3

That means for post-treatment 6MWT were 104.3±82.4 for first week, 137.6±111.8 for second week, 205.3±130.5 for third week, 234.3±123.3 for fourth week. The result showed improvement in the distances walked by patients during their four-week treatment.

IV. DISCUSSION

The present study was aimed to determine the effects of active cycle of breathing technique in mild to moderate asthmatic patients. The study was assessed by airway questionnaire 20 and six-minute walk test for both pre and post treatment. A total of six patients who had mild to moderate asthma were treated with active cycle of breathing technique, three times per week for one month in improving the health-related quality of life and functional capacity. 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 active cycle of breathing technique. [46] A study conducted on patient with bronchiectasis also reported similar effectiveness of postural drainage and ACBT equally. The efficacy of active cycle of breathing technique 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 aetiology.

Beside active cycle of breathing technique many other physiotherapy techniques are reported and used for pulmonary rehabilitation. There are other studies that compared active cycle of breathing technique with autogenic drainage but there few evidences which prefer active cycle of breathing technique over any other airway clearance technique. The analysis of means of distance walked among groups in meters showed significant improvement. The post-treatment mean of six-minute walk test for week one was 101.3±82.4 while the post-treatment mean of six-minute walk test for week four was 234.3±123.3. So, there is a significant improvement in the functional capacity of patients during a first, second, third and fourth week of treatment. This study used only two measurement tools such as airway questionnaire and six-minute walk test.

The effectiveness of the intervention was measured through improvement in FEV1/FVC, FEV1, and FVC. This study showed that there was an equal level of improvement in FEV1, FVC and modified Borg scales. 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 drainage. A systemic review found evidence for the effectiveness of active cycle of breathing technique in patients with chronic obstructive pulmonary disease and cystic fibrosis. The results showed increased sputum production during and up to one hour post active cycle of breathing technique in comparison with conventional chest physiotherapy.

V. CONCLUSION

This study concludes that the active cycle of breathing technique is very beneficial as an adjunct treatment for improving health-related quality of life and functional capacity of asthmatic patients. Recommendations are active cycle of breathing technique can be useful during cardio-pulmonary rehabilitation.

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