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Research Paper

Active Cycle Breathing Exercise on Pulmonary Parameters among Patient with Bronchial Asthma

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ABSTRACT:
Introduction: *Bronchial asthma is a major non-communicable disease causes inflammation and narrowing the small air passages in the lungs. Active cycle of breathing technique is one of the effective breathing exercises to clear the secretions and widen the airway. Hence this study was conducted with the aim to determine the effectiveness of active cycle of breathing technique on respiratory parameters among patients with bronchial asthma.* ***Methods:*** *Pre-experimental research design was adopted to conduct the study with 15 samples who met the inclusion criteria. Demographic variables were collected by using structured questionnaire and assessed the respiratory parameters such as oxygen saturation, respiratory rate, peak expiratory flow rate. Followed by active cycle of breathing technique was administered to the participants daily for one week. Post-test was conducted at end of seventh day using the same tool. Data were analyzed using SPSS statistical package.* ***Results:*** *There was a significant improvement was observed in, respiratory at the level of $p<0.05$.* ***Conclusion:*** *The findings of the study concluded that active cycle breathing technique is effective in respiratory parameters thereby improve the pulmonary function and prevent the complications associated with bronchial asthma.*
Keywords: *Active cycle breathing technique, bronchial Asthma, oxygen saturation, peak expiratory flow rate, respiratory parameters, and respiratory rate.*

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I. INTRODUCTION:

Lung or pulmonary diseases are one of the leading causes of death in developing countries [1]. The lung is the vital organ most vulnerable to infection and injury from the external environment because of its constant exposure to particles, chemicals and infectious organisms in ambient air. In Southeast Asia, approximately 15% of all disability adjusted life years lost due to lower respiratory infection, tuberculosis (TB), chronic obstructive pulmonary disease, and bronchial asthma [2]. Asthma is a major non-communicable disease (NCD), affecting both children and adults in long term. Inflammation and narrowing of the small air passages in the lungs cause asthma symptoms, which can be any combination of cough, wheeze, shortness of breath and chest tightness. It is reported that asthma affected 262 million people in 2019 and caused 461000 deaths [3]. The prevalence of asthma is increasing worldwide, and it is estimated to add 100 million more asthmatic patients by the year 2025 [4,5]. The estimated prevalence rate of asthma in India is of 2% up to as high as 23% as reported by many previous studies [6-11]. WHO is committed to improving the diagnosis, treatment, and monitoring of asthma thereby to reduce the global burden of NCDs [12]. Asthma cannot be cured, but good management with inhaled medications can control the disease and enable people with asthma to lead a normal and active life. Beyond the pharmacological management of asthma with bronchodilators, steroids, inhalers, breathing exercise is also an effective way to control the symptoms associated with asthma. The peak flow meter warns to the tightening of the airways often hours or even days before asthma symptoms as smooth muscles that surround the airways tighten and causes the airways to narrow during asthma attack [13]. Pulmonary rehabilitation (PR) is widely accepted as an effective treatment for patients with bronchial asthma. The breathing exercises increase the PEFR and FEV1% by increase the oxygen supply due to relaxation on bronchial muscle [14]. Amongst active cycle of breathing technique (ACBT) is an active breathing technique may be implemented by the patient to loosen and clear secretions from the lungs [15], improve ventilation in the lungs and to improve the

effectiveness of a cough [16, 17]. Deep breathing/thoracic expansion exercises are deep breathing exercises that focus on inspiration [18] and help to loosen secretions on the lungs [19] and complement the management of bronchial asthma. Hence the present study was conducted with the aim to determine the effectiveness of active cycle breathing technique on pulmonary parameters among patients with bronchial asthma.

II. METHODS AND MATERIALS

A Pre-experimental research design with one group method of pre and post test research design was adopted to conduct the study in Saveetha Medical College Hospital after obtaining formal permission with hospital authority. 15 patients with bronchial asthma were selected from general medicine and chest medicine ward by using a non randomized purposive sampling technique. The criteria for sample selection were patients who are aged above 20 years with mild to moderate asthma and are willing to participate in the study. The exclusion criteria for the patients were patients with other concomitant illness like cardiac diseases, e.g. (ischemic heart disease, lung disease such as chronic bronchitis, tuberculosis, bronchiectasis) and patients using any bronchodilators and with mental illness. The purpose of the study was explained to the participants and written informed consent was obtained from them. The demographic data were collected using a structured questionnaire, followed by heart rate, respiratory rate, blood Pressure, oxygen Saturation and peak expiratory flow rate were assessed. Active Cycle Breathing Exercise was administered to the participants. Participants were received instructions on procedure of breathing exercise and instructed to do the exercise daily for one week. The participants were monitored for any untoward events during exercise and were stable during exercise. Post-Test was done at the end of 7^{th} day by assessing heart rate, respiratory rate, blood Pressure, oxygen saturation and peak expiratory flow rate. Data were analyzed by using descriptive and inferential statistics. The patients' characteristics were described using frequency and percentage. Paired 't' test was used to assess the effectiveness of Active Cycle Breathing Exercise on respiratory parameters among bronchial asthma patients.

III. RESULTS:

Table 1. Distribution of the demographic variables of patients with Bronchial Asthma

Demographic Variables	Frequency	Percentage
Age (in years)		
30 – 35	4	26.7
36 – 40	6	40.0
41 – 46	3	20.0
More than 467	2	13.3
Sex		
Male	7	46.7
Female	8	53.3
Educational Status		
Illiterate	5	33.3
Primary education	4	26.7
Secondary education	5	33.3
Higher secondary and above	1	6.7
Occupational Status		
House- wife	4	26.7
Business man	1	6.7
Agriculture	5	33.3
Self- employed	5	33.3
Income Status (in Rupees)		
10000- 50000	11	73.33
50000- 100000	4	26.7
>100000	-	-
Marital Status		
Married	11	73.3

Demographic Variables	Frequency	Percentage
Unmarried	4	26.7
Area of Residence		
Urban	5	33.4
Rural	8	53.3
Semi urban	2	13.3
Family History of Bronchial Asthma		
Yes	10	66.7
No	5	33.3
Duration of Bronchial Asthma		
<1 year	5	33.3
1- 3 years	8	53.4
>3 years	2	13.3
Habit of Smoking		
Yes	8	53.3
No	7	46.7
Habit of Breathing Exercise		
Yes	4	26.7
No	11	73.33
Dietary Pattern		
Vegetarian	3	20.0
Non- vegetarian	12	80.0

Regarding demographic variables as depicted in Table .1, among 15 participants, most of them 6(40%) were aged between 36 – 40 years, 8(53.3%) were female, 5(33.3%) were illiterates and had secondary education respectively, 5(33.3%) were agriculturist and self – employed, 11(73.3%) were in income range of Rs.10000 – Rs.50000, 11(73.3%) were married, 10(66.7%) had family history of bronchial asthma, 8(53.4%) had bronchial asthma for 1 – 3 years, 8(53.3%) had the habit of smoking, 11(73.33%0 had no habit of breathing exercise and 12(80%) were non-vegetarian.

Table - 2. Distribution of pretest and post test respiratory and cardiac parameters among patients with bronchial asthma

Respiratory Parameters	Range	Pre-test Percentage	Post-Test Percentage
Respiratory rate	Bradypnea (<18 breath / minute)	0	0
	Normal (18 – 24 breath / minute)	93.33	46.67
	Tachypnea (>24 breath / minute)	6.67	27.33
Oxygen Saturation	Hypoxemia (<95% mmHg)	33.33	26.67
	Normal (98-100%)	66.67	73.33
Peak Exploratory Flow Rate	Low Peak Flow (<400 litres/minute)	33.33	20.0
	Normal (400 – 700 litres/minute)	6.67	20.0
	High Peak flow (>700 litres/minute)	60.0	60.0

In pre-test, with regard to respiratory rate, 14(93.33%) were normal and 1(6.67%) had tachypnea. With respect to oxygen saturation rate, 10(66.67%) had 100% oxygen saturation and 5(33.33%) had hypoxemia. Regarding peak exploratory flow rate, 9(60%) had high peak flow rate, 5(33.33%) had low peak flow rate and 1(6.67%) had normal.

In Post-test, with regard to respiratory rate, 8(53.33%) had tachypnea and 7(46.67%) had normal breathing pattern. With respect to oxygen saturation rate, 11(73.33%) had 100% oxygen saturation and

4(26.67%) had hypoxemia. Regarding peak exploratory flow rate, 9(60%) had high peak flow rate and 3(20%) had low and high peak flow rate as shown in Table -2.

Table 4: Effectiveness and comparison of pretest and post test level of respiratory parameters patients with bronchial asthma.

Respiratory Parameters	Test	Mean	S.D	Paired 't' test
Respiratory rate	Pretest	21.47	2.56	**t = 2.351 p = 0.034 S***
	Post Test	24.40	4.29	
Oxygen saturation rate	Pretest	83.0	12.93	t = 0.743 p = 0.469 N.S
	Post Test	87.67	19.99	
Peak Exploratory Flow Rate	Pretest	516.67	169.73	t = 0.374 p = 0.714 N.S
	Post Test	496.67	145.73	

*p<0.01, S – Significant, N.S – Not Significant

The table 4 shows the pre-test mean score of respiratory rate was 21.47±2.56 and the post test mean score was 24.40±4.29. With respect to oxygen saturation rate, the pretest mean score was 83.0±12.93 and post test mean score was 87.67±19.99. Regarding peak exploratory flow rate, the pre-test mean score was 516.67±169.73 and the post test mean score was 496.67±145.73. The calculated value of paired't' test value for oxygen saturation rate (t = 0.743, p=0.469), and peak exploratory flow rate (t = 0.374, p=0.714) was not found to be statistically significant which clearly infers that there was no significant change in the above mentioned respiratory parameters. The calculated value of paired't' test value for respiratory rate (t = 2.351, p=0.034) was found to be statistically significant at p<0.05 level which clearly infers that there was a significant change in respiratory rate among patients with bronchial asthma.

IV. DISCUSSION

Bronchial asthma is an increasing prevalence in global phenomenon and the management of Bronchial Asthma patient is complex to plan for a proper care. All structures of the bronchi are involved in inflammation and remodeling processes occur in both large and small airways in asthma and it is correlated to the clinical severity of the disease [20, 21]. The primary and ideal responsible for nurses is assessing the physiological indices in order to provide the effective nursing care to avoid breathing associated complications and promote well-being of bronchial asthma patients. The present study found that 1(6.67%) had tachypnea, and 5(33.33%) had hypoxemia and low peak flow rate. Nidhi Banga et al quoted that wheeze detection, SpO2 (oxygen saturation level), Respiratory rate and hearth rate are the most common physiological parameters used for monitoring asthma [22]. Kesten et al have found that the respiratory rate increases naturally during asthmatic attack [23]. In another study by Arnold DH et al [24] determined the relationship between oximeter plethysmograph Waveform and %FEV1 (forced exhale volume per second) and how %FEV1 changes in terms of response when treating asthmatic patients with extreme exacerbations. The current study lacks in assessing the FEV1 and included only mild to moderate asthmatics patients. The Active Cycle Breathing Techniques (ACBT) is an active breathing technique performed by the patient and can be used to mobilize and clear excess pulmonary secretions to improve lung function. It is a flexible method of treatment that can be used in conjunction with positioning and adapted for use with most patients. The current study findings demonstrated that, there is no significance difference in oxygen saturation and peek expiratory flow rate however there was a significant change in respiratory rate after active cycle breathing technique. The present study finding is supported by study done by Dipti Agarwal et al concluded that breathing exercises provided significant improvements in spirometric parameters and significant reduction in breathlessness, wheezing, and nocturnal symptoms as well as requirements of rescue medicines in asthma patients who were receiving optimal asthma treatment [25]. Similarly study by Bipin Puneetha et el who proved that postural drainage and ACBT have significant effect in clearing airways and thereby improving pulmonary function in bronchiectasis[26]. Savci et al, who conducted the study on long term treatment of autogenic drainage and active cycle breathing technique in patients with COPD and proved that an active cycle breathing technique increased post vital capacity, peak expiratory flow rate, oxygen saturation [27]. Moreover Thenmozhi.P et al reported active cycle breathing technique is effective in clear the pulmonary secretion thereby improve the pulmonary function prevent the pulmonary complications after coronary artery bypass graft [28]. There are very limited studies related to impact

of active cycle breathing technique among bronchial asthma. The present study findings accepted the hypothesis that there is significant improvement in pulmonary parameters only in respiratory rate and found no complications during intervention period. Similar study may be extended with longer duration and large samples to determine the effectiveness in other parameters too. The cellular, biochemical, immunologic, and molecular markers play an important role in airway inflammation. The current study recommend to determine the efficacy of active cycle breathing technique on cellular, biochemical, immunologic, and molecular markers and even can assess the quality of life of patients among bronchial asthma.

V. CONCLUSION:

The findings of the present study concluded that the active cycle breathing exercise is effective in improving the respiratory parameters especially in respiratory rate among patient with bronchial asthma. It helps to diminish the complications associated with bronchial asthma and minimize the length of hospital stay. Moreover, active cycle breathing technique is not a cost effective; it can be performed by patient concerns and complement the regular treatment. Awareness campaigns can conduct to raise awareness on this technique especially in this COVID pandemic.

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AUTHORS CONTRIBUTION:

All the authors actively participated in the work of the study. All authors read and approved the final manuscript.

CONFLICT OF INTEREST:

The authors declare no conflicts of interest.

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