Original Article

Effects of Breathing Exercises on Breathing Pattern, Lung Capacities and Quality of Life in Asthmatic Patients: A Randomized Controlled Trial

Zaryyab[1], Zainab Hassan[2], Shahzaib Raza Shah[1], Sameen Saeed[3] and Naveed Anwar[2]

ABSTRACT

Objective: To access the effects of breathing exercises on dysfunctional breathing pattern and quality of life in the patients of asthma.

Study Design: Randomized Controlled Trial study

Place and Duration of Study: This study was conducted at the Kanaan Physiotherapy & Spine clinic for 5 months from June 2021 to October 2021.

Materials and Methods: Study included 20 participants with age ranges from 15 to 45 years. All the participants were divided into two groups. Participants were assessed pre and post treatment by using spirometry, 10-item breathing pattern observational questionnaire and asthma- related quality of life questionnaire (Mini AQLQ). Group A received papworth breathing technique and Group B received buteyko breathing technique.

Results: The age of the individuals included in this study has mean age 31.20 ± 6.371 ranging from 15 years to 45 years. The quality of life of asthma patients was accessed using mimi AQLQ questionnaire which gave non-significant results. The 10-item breathing pattern observational questionnaire gave significant results. Whereas, the effect of breathing techniques on lung capacities was non-significant as measured by spirometery.

Conclusion: The results of the breathing techniques used in this study named papworth and buteyko methods were accessed using mini asthma quality of life questionnaire, spirometry measurements and Breathing Pattern, 10- item Observational List. The study concludes that breathing techniques showed no significant changes in quality of life but breathing pattern of asthmatic patients can be improved using these techniques.

Key Words: Breathing retraining exercises, asthma, dysfunctional breathing, lung capacities of asthmatic patients, quality of life in asthma.

Citation of article: Zaryyab, Hassan Z, Shah SR, Saeed S, Anwar N. Effects of Breathing Exercises on Breathing Pattern, Lung Capacities and Quality of Life in Asthmatic Patients: A Randomized Controlled Trial. Med Forum 2021;32(11):145-149.

INTRODUCTION

A chronic disease that involves the lung airways is defined as asthma. These airways also called the bronchial tubes, allow bilateral flow of air into and out of the lungs. Asthmatic patients have inflamed airways. When the person is exposed to various irritants and substances that trigger allergies (allergens) they become even more swollen and the surrounding muscles of the airways can tighten[1].

Acute asthmatic patients characteristically hyperventilate which is refelected by low PaCO2 levels. These levels effect the value of FEV1. McFadden and Lyons1 noted mean FEV1; 59 % reflects mild airway obstruction, mean FEV1; 35 % reflects severe airway obstruction and mean FEV1; 18% reflects severe airway obstruction. Hypercapnia occurs when FEV1 falls below 15 %. Hyperventilation in asthmatic patients is based on the measurements of PaCO2. But direct measurement of minute ventilation is very difficult to obtain in patients who have a severe attack because they can poorly tolerate mouthpieces and noseclips. However, according to evidence the patients experiencing an acute attack or patients with chronic history of asthma display an increased minute ventilation along with elevated respiratory center drive.[2-5]

1. Department of Physical Therapy, Hajvery University, Lahore.
2. Department of Physical Therapy, Riphah International University, Lahore.
4. Department of Physical Therapy, Allama Iqbal Medical College, Lahore.

Correspondence: Dr. Zaryyab, Lecturer, Hajvery University, Lahore.
Contact No: 03321444815
Email: drzaryyab@hup.edu.pk

Received: October, 2021
Accepted: October, 2021
Printed: November, 2021

In addition to above mentioned symptoms, asthmatic patients display other abnormalities in breathing pattern such an increase in tidal volume or short period of inspiratory time, although the respiration frequency may be normal or increased.[6-8]

There are breathing techniques that deals with asthma. The aim of these exercises is to the correct the dysfunctional or irregular pattern of breathing. Dysfunctional breathing comprises multidimensional entity with three key dimensions being biochemical, biomechanical and psychophysiological. The objective is to explore these dimensions and their impact on asthmatic patients and to view how breathing therapy protocols effect these dimensions. It also determines if there is any evidence that suggests breathing therapy protocols and their optimization.[9]

Previous studies have shown the relation between asthma and dysfunctional breathing pattern. Dysfunctional breathing patterns may response to therapeutic exercises defined as breathing retraining; improvements have previously been reported in different clinical studies.[10,11] According to 2009 Physiotherapy Guidelines[12], breathing retraining results in the reduction of respiratory rate and/or tidal volume alongwith relaxation training, which helps in controlling the symptoms of asthmatic patients.

A patient having disoriented breathing pattern may go for compensation for lung filled with air and being over-inflated and elevated tidal volume (e.g., end of tidal volume over functional residual capacity FRC) to achieve the FRC. An increase in FEV1 of 12% or 200 ml explains the reversibility of the airflow obstruction. That's why the lung capacities will also be measured in this study.

Breathing retraining comprise of teaching the breathing techniques (route of breathing, speed of breathing, techniques of relaxation) to modify the patterns of breathing and to improve the efficiency of breathing[13]. It can reduce the symptoms and helps in the improvement of quality of life (QoL) of asthma people. It may also reduce medications[14] and recommended as an adjuvant treatment for adults with uncontrolled asthma despite taking the standard treatment protocols.[12]

The study aimed to guide physiotherapy breathing retraining exercises to the patients of asthma who have dysfunctional breathing symptoms. And the effect of these exercises will be determined over time. These breathing retraining exercises may provide an opportunity to improve the life of people treated for asthma in the community, and may also create awareness regarding physiotherapy services and its role in pulmonary rehabilitation.

MATERIALS AND METHODS

This study was a Randomized Controlled Trial. This study was conducted in Kanaan Physiotherapy & Spine clinic for 5 months from June 2021 to October 2021. This research included 20 participants with age ranges from 15 to 45 years. All the participants were divided into two groups. Participants were assessed pre and post treatment by using spirometry, 10-item breathing pattern observational questionnaire and asthma- related quality of life questionnaire (Mini AQLQ). The subjects were assigned in two groups A&B by lottery method.

Group A: After taking informed consent, papworth breathing technique is guided in a supervised session to the patient and is practiced in independent sessions five days per week for a period of 3 months.

Group B: After taking informed consent, buteyko breathing technique is guided in a supervised session to the patient and is practiced in independent sessions five days per week for a period of 3 months.

Study was completed in six months after synopsis approval. Asthma patients with age ranging between 15-45 years with receipt of at least one anti-asthma medication in the past 1 year and impaired quality of life due to asthma were included in the study. Whereas, asthmatic patients with pregnancy, any severe disease diagnosed by physician and who have participated in any other respiratory interventional research project were excluded. SPSS was used for statistical analysis. Qualitative variables were presented by using histogram for age and pie chart for gender. Whereas, quantitative variables were provided as mean standard deviation. After normality testing, Man-Whiteny test was used for non- parametric data and Shapiro-walk test was used to check the data normality according to which further statistical tests were applied. To access the results of change over time data was analyzed through pre and post independent T test. To access the results of difference between groups paired sample t test was used. All quantitative variables were provided as mean standard deviation. P-values less than 0.05 were considered significant.

RESULTS

Age: The individuals included in this study have mean age 31.20 ± 6.371 ranging from minimum 18 years to maximum 42 years with total 20 number of individuals.

Gender: The gender of individuals that participated in this study were 55.00% male and 45.00% female with total 20 number of individuals.

Table No.1: Pre and post treatment with mean different and p value

	Group A	Group B	Mean Diff	P value
Pre Treatment	57.67 ±11.47	58.67 ± 8.4	1.00	0.82
Post Treatment	60.56 ± 8.97	61 ± 8.46	-0.44	0.91
Mean Diff	-2.89	-2.33		
P value	0.16	0.45		

Mini AQLQ: Data across the group was determined using independent sampleT test, with pre-treatment p-value 0.82 and post-treatment p-value 0.9.Data within the group was determined using paired sample test, with group A having p-value of 0.16 and group B hng p-value 0.45 (Table 1).

FVC/FEV1: Data across the group was determined using independent sample T test, with pre-treatment p-value 0.95 and post-treatment p-value 0.98. Data within the group was determined using paired sample test, with group A having p-value of 0.45 and group B having p-value 0.43. (Table 2)

Table No.2: Group details with p values

	Group A	Group B	Mean Diff	P value
Pre Treatment	74.22 ± 10.18	74.10 ± 6.48	0.20	0.957
Post Treatment	76.55 ± 6.34	76.5 ± 6.41	0.05	0.985
Mean Diff	-2.33	-2.4		
P value	0.45	0.43		

Rhythmic Respiration: The pie charts shows significant changes in post-rhythmic respiration which has been increased to 80% from pre-treatment value which was 50%. Accordingly, the post-treatment value of patients with no rhythmic respiration has been reduced to 20% from pre-treatment value which was 50%.

Inspiration by Upper Thorax: The pie charts shows significant changes in post treatment inspiration by upper thorax. As 30% patients with no upper thoracic inspiration has been reduced to 10%, 30% patients with partly upper thoracic inspiration has been increased to 50%, whereas, 40% of patients with upper thoracic inspiration remained the same.

Nasal Inspiration: The pre-treatment percentage of patients with nasal inspiration has been increased to 80% which was previously 50%, patients with partly nasal breathing has been reduced to 20% from 40%, whereas, no patients were found with no nasal breathing after the treatment was induced.

Bodily Movement: The bodily movements were improved from 60 % to 70 % post treatment value. Accordingly, patient percentage with no bodily movement has been reduced to 30% which was previously 40%.

DISCUSSION

The age of the individuals included in this study have mean age 31.20 ± 6.371 ranging from 15 years to 45 years with total 20 number of individuals. While the gender of individuals that participated in this study were 55.00% male and 45.00% female with total 20 number of individuals.

The quality of life of asthmatic patients was accessed using mini AQLQ questionnaire. The questionnaire was filled before and after treatment sessions given. The results of the data across the group was determined using independent sample T test, with pre-treatment p-value 0.82 and post-treatment p-value 0.91. Same data within the group was determined using paired sample test, with group A having p-value of 0.16 and group B having p-value 0.45. Both gave non-significant results.

Another study explained that breathing training resulted in improvements in asthma-specific health status and other patient-centred measures but not in asthma pathophysiology. Such exercises may help patients whose quality of life is impaired by asthma, but they are unlikely to reduce the need for anti-inflammatory medication. Whereas, in current study patients reported improvement in their quality of life following the exercise regime. But no significant results were found by using the asthma related quality of life questionnaire. Added benefit of relaxation was achieved due to breathing pattern control.[14]

The spirometery measurements were used to access the FVC/FEV1 ratio to determine the effect of the techniques used in this study. Data was taken before and after the sessions. Data across the group was determined using independent sample T test, with pre-treatment p-value 0.95 and post-treatment p-value 0.98. Same data within the group was determined using paired sample test, with group A having p-value of 0.45 and group B having p-value 0.43. Both the results are not significant.

In 2018 von Bonin, D., Klein, S.D., Worker, J conducted a study which finds that speech guided breathing retraining significantly improves asthma control and quality of life in patients with asthma. Whether ATS may improve lung function remains to be shown. In our study patients included in the study shows no significant improvement in lung function test as accessed through spiromtery measurements.[15]

The breathing pattern observational questionnaire was used to access the effect of breathing techniques on the breathing pattern of asthmatic patients. According to the results, the breathing exercises used gave no significant improvement in breathing pattern.

Respiration frequency data across the group was determined using independent sample T test, with pre-treatment p-value 0.75 and post-treatment p-value 0.61. Same data within the group was determined using paired sample test, with group A having p-value of 1.0 and group B having p-value 0.70.

The pie charts shows significant changes in post-rhythmic respiration which has been increased to 80% from pre-treatment value which was 50%. Accordingly, the post-treatment value of patients with no rhythmic respiration has been reduced to 20% from pre-treatment value which was 50%.

The pie charts shows significant changes in post treatment inspiration by upper thorax. As 30% patients with no upper thoracic inspiration has been reduced to 10%, 30% patients with partly upper thoracic inspiration has been increased to 50%, whereas, 40% of patients with upper thoracic inspiration remained the same.

The pie chart shows changes in partly inspiration by diaphragm value which has been increased post treatment to 40% from pre-treatment value which was 30%, whereas, patients with inspiration by diaphragm have been reduced to 50% from pre-treatment value which was 60%. The percentage of patients which no diaphragmatic inspiration remained the same 10%.

The pre-treatment percentage of patients with nasal inspiration has been increased to 80% which was previously 50%, patients with partly nasal breathing has been reduced to 20% from 40%, whereas, no patients were found with no nasal breathing after the treatment was induced.

The bodily movements were improved from 60% to 70% post treatment value. Accordingly, patient percentage with no bodily movement has been reduced to 30% which was previously 40%.These results of breathing pattern questionnaire shows that prominent changes have been seen over a period of 3 weeks in the breathing pattern of asthma patients followed by breathing retraining exercises.

A study done in 2012 by O'Connor, Patnode et al concludes that behavioral approaches that include hyperventilation reduction techniques can improve asthma symptoms or reduce reliever medication use over 6 to 12 months in adults with poorly controlled asthma and have no known harmful effects. Evidence supporting yoga breathing is weaker and applicability to the United States is very low. Whereas, in this study we used two breathing techniques and compared them to find out the best possible exercise that could be used in case of asthma. Non significant results were analysed during their comparison. Although patient relaxation and reduction in symptoms was observed.[1]

CONCLUSION

The results of the breathing techniques used in this study named papworth and buteyko methods were accessed using mini asthma quality of life questionnaire, spirometry measurements gave non-significant results. Whereas, significant changes have been observed in breathing pattern after these methods were used to improve the breathing as accessed through Breathing Pattern, 10-item Observational List. Therefore, it concludes that these techniques showed no significant changes in quality of life but breathing pattern of asthmatic patients can be improved using these techniques.

Author's Contribution:

Concept & Design of Study:	Zaryyab
Drafting:	Zainab Hassan, Shahzaib Raza Shah
Data Analysis:	Sameen Saeed, Naveed Anwar
Revisiting Critically:	Zaryyab, Zainab Hassan, Maryam Asif
Final Approval of version:	Zaryyab

Conflict of Interest: The study has no conflict of interest to declare by any author.

REFERENCES

1. O'Connor E, Patnode C, Burda B, Buckley D, Whitlock E. AHRQ comparative effectiveness reviews. breathing exercises and/or retraining techniques in the treatment of asthma: comparative effectiveness 2012.
2. Kassabian J, Miller KD, Lavietes MH. Respiratory center output and ventilatory timing in patients with acute airway (asthma) and alveolar (pneumonia) disease. Chest 1982; 81(5):536-43.
3. Tobin MJ, Chadha TS, Jenouri G, Birch SJ, Gazeroglu HB, Sackner MA. Breathing patterns: 1. Normal subjects. Chest. 1983;84(2):202-5.
4. Tobin MJ, Birch S, Jenouri G, Sackner MA. Acute effects of aerosolized metaproterenol on breathing pattern of patients with symptomatic bronchial asthma. J Allerg Clin Immunol 1985; 76(2):166-72.
5. Hillman DR, Prentice L, Finucane KE. The pattern of breathing in acute severe asthma. Am Review Respiratory Dis 1986;133(4):587-92.
6. Hedstrand U. Ventilation, gas exchange, mechanics of breathing and respiratory work in acute bronchial asthma. Acta Societatis Medicorum Upsaliensis 1971;76(5-6):248-70.
7. Millman RP, Silage DA, Peterson DD, Pack AI. Effect of aerosolized histamine on occlusion pressure and ventilation in humans. J Applied Physiol 1982;53(3):690-7.
8. Tobin MJ, Yang K. Weaning from mechanical ventilation. Critical Care Clinics 1990;6(3): 725-47.
9. Courtney R. Breathing training for dysfunctional breathing in asthma: taking a multidimensional approach. ERJ Open Res 2017;3(4).
10. DeGuire S, Gevirtz R, Hawkinson D, Dixon K. Breathing retraining: a three-year follow-up study of treatment for hyperventilation syndrome and associated functional cardiac symptoms. Biofeedback and Self-Regulation 1996;21(2): 191-8.
11. Han J, Stegen K, De Valck C, Clement J, Van de Woestijne K. Influence of breathing therapy on

complaints, anxiety and breathing pattern in patients with hyperventilation syndrome and anxiety disorders. J Psychosomatic Research 1996;41(5):481-93.

12. Bott J, Blumenthal S, Buxton M, Ellum S, Falconer C, Garrod R, et al. Guidelines for the physiotherapy management of the adult, medical, spontaneously breathing patient. Thorax 2009; 64(Suppl 1):i1-i52.
13. Bruton A, Thomas M. The role of breathing training in asthma management. Current opinion in allergy and Clinical Immunol 2011;11(1):53-7.
14. Thomas M, McKinley RK, Mellor S, Watkin G, Holloway E, Scullion J, et al. Breathing exercises for asthma: a randomised controlled trial. Thorax 2009;64(1):55-61.
15. von Bonin D, Klein SD, Würker J, Streit E, Avianus O, Grah C, et al. Speech-guided breathing retraining in asthma: a randomised controlled crossover trial in real-life outpatient settings. Trials 2018;19(1):1-8.