ORIGINAL ARTICLE

ADDITIVE EFFECTS OF ALTERNATE NOSTRIL BREATHING WITH PHARMACOLOGICAL MANAGEMENT ON DYSPNOEA AND CONTROL PAUSE IN PATIENTS WITH BRONCHIAL ASTHMA

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Background: Bronchial asthma is a chronic respiratory disease characterized by airway inflammation and constriction, leading to breathlessness and wheezing. This study aimed to compare the effects of Alternate Nostril Breathing (ANB) combined with pharmacological management versus pharmacological management alone on dyspnoea and control pause in patients with bronchial asthma. **Methods:** A non-blinded randomized controlled trial was conducted at Foundation University College of Physical Therapy, Foundation University Islamabad, and Fauji Foundation Hospital, Rawalpindi from February 2024 to January 2025. Thirty-two patients diagnosed with bronchial asthma were recruited after pulmonologist referral. Participants with Grades 0–4 on the Modified MRC Dyspnoea Scale were included. The control group received pharmacological management, whereas the interventional group performed ANB in addition to standard therapy for four weeks, with two supervised and five home sessions per week. Dyspnoea was assessed using the Dyspnoea-12 Questionnaire and control pause using a stopwatch. All measurements were taken at baseline and after four weeks. Data were analysed using SPSS-23. **Results:** Between-group analysis showed a statistically significant difference in dyspnoea and control pause, favouring the interventional group. Within-group analysis revealed significant improvement in both groups after four weeks, with greater gains in the interventional group. **Conclusion:** Incorporating Alternate Nostril Breathing alongside pharmacological management is more effective than medication alone for improving dyspnoea and control pause in patients with bronchial asthma.

Keywords: Asthma, Breathing exercises, Dyspnoea

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INTRODUCTION

Bronchial asthma, a chronic inflammatory disorder of the airways, has been recognized as a major global health challenge since the 1970s.[1] According to the World Health Organization (WHO), bronchial asthma affects about 339 million people globally, with over 400,000 deaths annually.[2] It is prevalent among both children and adults, with around 7 million children, 10 million men and 14.6 million women affected worldwide.[3,4] According to the Global Asthma Report 2022, the prevalence in Pakistan was 4.3%.[5] Bronchial asthma is a chronic inflammatory disorder of the airways characterized by reversible narrowing, mucus hypersecretion, and airway hyper-responsiveness, resulting in dyspnoea, wheezing, and cough that often worsen at night or early morning.[6] Multiple triggers such as allergens, infections, smoking, and environmental pollutants contribute to airway inflammation and remodelling, which ultimately increase airflow resistance and impair lung function.[6,7]

Among various non-pharmacological approaches, the Buteyko Breathing Technique (BBT) has gained attention as an adjunct therapy for asthma management. Developed by Dr. Konstantin Buteyko in the 1950s, this method aims to correct chronic hyperventilation by encouraging slow, shallow nasal breathing and incorporating breath-holding exercises, known as ‘control pause’, to improve carbon dioxide retention and airway relaxation. Studies suggest that regular practice of Buteyko Breathing can reduce asthma symptoms, improve control of dyspnoea and lower the need for bronchodilators by normalizing breathing patterns and enhancing respiratory efficiency.[8,9] Specific breathing techniques benefit individuals with bronchial asthma, particularly Alternate Breathing Exercise (ABE) also known as Anulom-vilom Pranayama/Nadi-suddhi pranayama have emerged as a widely used and an effective method. This technique involves alternate inhalation and exhalation through left and right nostrils. It regulates respiratory rate, improves lung function, reduces shortness of breath, and relieves fatigue in asthmatic patients.[10,11] Each nostril is connected to the contra-lateral brain hemisphere. Breathing through the left nostril stimulates the parasympathetic nervous system, which promotes relaxation and improves dyspnoea and respiratory rate, while the right nostril stimulates the sympathetic nervous system, which triggers alertness.[12]

Breathing techniques, alongside traditional medical treatments, can effectively manage respiratory symptoms by correcting hyperventilation, normalizing carbon dioxide levels, stabilizing breathing patterns, optimizing oxygen delivery and strengthen respiratory muscles. Inhaled corticosteroids and bronchodilators remain the mainstay therapies for asthma, as they reduce airway inflammation, improve lung function, and prevent bronchoconstriction and disease exacerbations.[13] While, evidence supports the efficacy of Alternate Nostril Breathing for bronchial asthma. Research is limited regarding its combined effects with standard management. This study aims to evaluate the additive effects of Alternate Nostril Breathing along with pharmacological management versus pharmacological management alone on dyspnoea and control pause in patients with bronchial asthma.

MATERIAL AND METHODS

A non-blinded randomized controlled trial was conducted at Foundation University College of Physical Therapy, Foundation University, Islamabad, and Fauji Foundation Hospital, Rawalpindi from February 2024 to January 2025. Ethical approval was taken from the Foundation University Medical College (ERC No. FF/FUMC/215-443/phy24). The trial was registered at clinicaltrials.gov (CTRI No. NCT06609941) and written informed consents were taken.

Individuals were recruited through non-probability purposive sampling due to the limited availability of clinically stable asthma patients who met the inclusion criteria and could commit to supervised breathing sessions. Participants were then randomized into Control and Interventional groups using the sealed envelope method to minimize allocation bias. The sample size was calculated using G*Power software version 23.0 based on an independent *t*-test, assuming an effect size of 0.8 (large effect), α level of 0.05, and a power of 80%, resulting in a total of 32 participants (16 in each group).

Subjects of either gender aged 18–45 years, with Grades 0–4 on the Modified Medical Research Council (mMRC) Dyspnea Scale and asthma severity classified as intermittent, mild persistent, moderate persistent, or severe persistent according to the National Asthma Education and Prevention Program (NAEPP) 2020 guidelines[2] were included in the study. Patients with COPD, exarbated status asthmaticus, acute infections or unable to follow instruction were excluded.

The Control group received pharmacological management, including Short acting bronchodilators (Albuterol, Levalbuterol etc.), Long acting bronchodilators (Salmeterol, Formoterol, Tiotropium etc.) and others (Inhaled corticosteroids, Anticholinergic, Leukotriene inhibitors and Xanthine's etc.). The Interventional group performed ANB daily alongside same pharmacological management. Medications were prescribed stepwise by pulmonologist based on symptoms and severity. For ANB, patients sat comfortably and breathe normally for about 2–3 minutes. They used the right thumb to close the right nostril, inhaled through the left nostril for 4 Sec. Held their breath for 2–3 Sec, then exhaled through right nostril. They then inhaled through right nostril for 4 Sec, held breath for 2–3 Sec. and exhale through the left nostril for 6 Sec. The cycle was repeated[15].

In weeks 1–2, the frequency was 1 session/ day, with 2–3 Sec of breath holding and 10 min duration. In weeks 3–4 it increased to 2 sessions/day, with 5–6 Sec of breath holding and 15 min duration. Two sessions/week was performed under supervision and 5 days at home. Outcome measures included Dyspnoea-12 Questionnaire (ICC=0.94) to assess severity of dyspnoea and a stopwatch to measure control pause.[16]

Data was entered and analysed using SPSS-23. Continuous variables were reported as Mean±SD. Categorical variables as frequencies and percentages. The Shapiro-Wilk test was used that indicated that the data were not normally distributed ($p<0.05$); therefore, non-parametric tests were applied. Between-group comparisons were analysed using the Mann-Whitney U-test, while within-group (pre-post) comparisons were analysed using the Wilcoxon Signed-Rank test.

RESULTS

Mean age of participants of whole sample (n=32) was 30.3±7.1 years. The average weight of all participants was 67.1±13.1 Kg and average height was 163.9±9.82 Cm. (Table-1). The Shapiro-Wilk test was used to assess normality, which indicated that some variables were normally distributed ($p>0.05$), while others showed non-normal distribution ($p<0.05$). Therefore, non-parametric tests were applied for consistency. Between-group comparisons were analysed using the Mann-Whitney U test, while within-group (pre-post) comparisons were analysed using the Wilcoxon Signed-Rank test. (Table-2)

Between-group analyses showed a statistically significant difference in dyspnoea and control pause, with the intervention group showing greater improvement ($p<0.05$). (Table-3). Within group analysis indicated a statistically significant improvement in the intervention group after four weeks of treatment ($p<0.05$). (Table-4).

Table-1: Demographic characteristics of control and interventional groups using the independent sample *t*-test (n=32)

Variables	Mean±SD		*p*
	Control Group	Interventional Group	
Age (Years)	29.2±5.87	31.3±8.32	0.41
Weight (Kg)	66.1±9.66	68.1±16.2	0.67
Height (Cm)	163.5±13.7	164.3±3.17	0.83

Table-2: Normality test results on data

Variables	*p* Control Group	Interventional Group
Pre dyspnoea score	0.130*	0.031
Post dyspnoea score	0.007	0.001
Pre control pause	0.001	0.126*
Post control pause	0.158*	0.540*

Table-3: Dyspnoea scores and control pause between control and interventional groups (Median±IQR)

Variable	Control Group	Interventional Group	*p*
Pre dyspnoea score	11.50 (12.5)	15.50 (20.7)	0.762
Post dyspnoea score	3.50 (10.0)	0.00 (2.75)	0.006*
Pre control pause	15.00 (4.0)	19.00 (4.0)	0.031
Post control pause	20.00 (5.0)	30.00 (1.75)	<0.001*

*Between-group comparisons were analyzed using the Mann-Whitney U test. A $p<0.05$ was considered statistically significant.

Table-4: Within group analysis of control and interventional group

Group	Variable	Assessment Time	Median (IQR)	*p*
Control Group	Dyspnoea score	Baseline	11.50 (12.5)	0.001*
		After 4 weeks	3.50 (10.0)	
	Control pause	Baseline	15.00 (4.0)	0.001*
		After 4 weeks	20.00 (5.0)	
Interventional Group	Dyspnoea score	Baseline	15.50 (20.75)	<0.001*
		After 4 weeks	0.00 (2.75)	
	Control pause	Baseline	19.00 (4.0)	<0.001*
		After 4 weeks	30.00 (3.75)	

Within-group (pre-post) comparisons were analysed using the Wilcoxon Signed-Rank test. *Statistically significant.

DISCUSSION

To manage bronchial asthma by integrating breathing exercises with pharmacological treatment is a composite approach particularly in aggravated symptoms such as dyspnoea and improving control pause. Although the pharmacological treatments have good results and control but the synergistic effects of combining specific breathing techniques, such as Alternate Nostril Breathing (ANB), with standard medical therapies remain underexplored. We investigated the comparative efficacy of ANB combined with pharmacological management versus pharmacological management alone in improving dyspnoea and control pause among patients with bronchial asthma.

Our results are supported by a similar study conducted by A. Ibrahim *et al*[17] highlighting effects of breathing exercises on dyspnoea. The results of their study revealed that the total mean score of dyspnoea in Alternate Nostril Breathing group significantly improved after 4 weeks of intervention ($p<0.05$).[17] Same in our study improvement in intervention group was seen with patients doing ANB alongside medications showed more reductions in dyspnoea compared to those receiving only pharmacological treatment. It is may be due to the fact that Alternate Nostril Breathing balances the autonomic nervous system by stimulating parasympathetic response through left nostril and sympathetic response through right nostril. It is a controlled breathing exercise which stimulates parasympathetic nervous system and has its improving effects on respiratory pathway and sympathetic activity decreases which alleviates shortness of breath.[12,18] ANB's controlled breathing pattern may increase the functions of diaphragm by optimizing the oxygen delivery, all this is augmented by the bronchodilatory and anti-inflammatory effects of medications such as corticosteroids and bronchodilators.[19]

Our study also demonstrates the contrast results for control pause[9], a method used to measure the breath-holding capacity that reflects respiratory control and lung function. Our findings indicate significantly more improvements in control pause in the intervention group compared to the control group after four weeks. These results are similar to a study conducted by David and Patil[20] who observed control pause. In accordance to our findings, their results also showed that Buteyko breathing was more effective to improve control pause but in control group there was insignificant change.

Notably, our study showed significant change in control group which received only pharmacological management. Control pause in control group was improved as we excluded severe persistent asthmatic patients and older adults because despite pharmacological treatment age and asthma classification may limit lungs function, making difficult to achieve longer control pause.[21] A comparable study by Vagedes K *et al*[9] investigated the effects of Buteyko breathing compared to standard treatment on control pause. The results of their study demonstrated a significant improvement in control pause in Buteyko group. Conversely, the group which received standard treatment showed minimal improvement.[9]

Pharmacological management helped to improve control pause, yet the improvement was significantly higher in patients practicing ANB along with pharmacological management. The possible mechanism behind control pause improvement might be the mechanism behind breathing exercise as it reduces hyperventilation and normalizes level of CO_2 and medications relieving symptoms of respiratory distress helping to improve control pause.[8]

The findings highlight that ANB combined with pharmacological management offers a simple, low-cost, and non-pharmacological adjunct that can be easily integrated into pulmonary rehabilitation programs. Incorporating such breathing techniques may enhance symptom control, promote patient self-management, and support a more holistic approach to the long-term management of chronic respiratory diseases.

LIMITATIONS OF STUDY

Due to the short duration, the long-term effects could not be evaluated. The small sample size and single-centre recruitment may limit the generalizability of the findings. Use of non-probability purposive sampling was considered a limitation of the study as it might have introduced selection bias and reduced the generalizability of the findings. Follow-up of patients was quite difficult, particularly to ensure that home based breathing exercise plan was regularly followed up.

CONCLUSION

Addition of Alternate Nostril Breathing along with standard pharmacological management is more effective compared to pharmacological management alone for improving dyspnoea and control pause in patients with bronchial asthma. Incorporation of ANB in daily practice can aid in managing bronchial asthma by fostering relaxation, alleviating stress and enhancing lung functions through controlled breathing.

RECOMMENDATIONS

1. Effects of intervention of longer duration could be studied to determine the persistent effects of ANB.
2. Future studies could also incorporate different nasal breathing exercises with pharmacological management to determine their combined effectiveness in patients suffering from other respiratory conditions such as COPD and hyperventilation syndrome etc.
3. Home based breathing exercises should be prescribed for asthmatic patients
4. Study could ensure assessment of respiratory function.

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