Link Medical Journal
of Health and Community Research

Link Medical Journal
of Health and Community Research

Volume 2, Issue 1 (January to June 2024)

Original Article

Comparison of Buteyko and Papworth Breathing Techniques on Pulmonary Function and Oxygen Saturation in Asthma Patients

Ahsan Ilyas[1], Junood Ahmad[2], Farah Khalid[3]

ABSTRACT

Background: *Asthma is a chronic inflammatory disorder of the lower respiratory tract characterized by symptoms such as cough, sneezing, chest tightness, and shortness of breath. The diagnosis of asthma is typically based on pulmonary volumes including Forced Vital Capacity (FVC), Forced Expiratory Volume at 1 second (FEV1), and FEV1/FVC ratio, all of which are reduced with increasing disease severity. There is no gold standard for asthma diagnosis, necessitating the use of various techniques to manage its symptoms effectively.*

Objective: *The aim of this study was to determine the comparative effects of the Buteyko breathing technique and the Papworth method on pulmonary functions and oxygen saturation in asthmatic patients.*

Methods: *Forty-two asthmatic patients (both male and female), aged 30-55 years, with FEV1 predicted < 80% and FEV1/FVC < 75%, were included in this randomized clinical trial conducted at Farooq Clinic Khushab. Participants were divided into two groups: Group A received the Buteyko breathing technique and Group B received the Papworth breathing technique. Both groups also received bronchial drainage as a conventional treatment. The WHO Quality of Life Scale and Asthma Control Test Questionnaire were used to evaluate quality of life and asthma symptoms. Pulmonary volumes (FVC, FEV1, and FEV1/FVC) were measured using digital spirometry, and oxygen saturation was assessed with an oximeter at baseline and after four weeks. Data were analyzed using SPSS version 25. Non-parametric tests were applied due to the non-normal distribution of data.*

Results: *Statistically significant improvements were observed in all outcome variables. Within Group A (Buteyko), the Wilcoxon Signed Rank Test showed a significant increase in FEV1 ($Z = -5.691$, $p < 0.000$), FVC ($Z = -5.667$, $p < 0.000$), FEV1/FVC ($Z = -5.622$, $p < 0.000$), and oxygen saturation ($Z = -5.687$, $p < 0.000$). Within Group B (Papworth), similar significant improvements were observed. The Mann-Whitney U Test indicated significant differences between groups at the 4th week for FEV1 ($U = 234.00$, $p < 0.000$), FVC ($U = 281.00$, $p < 0.000$), FEV1/FVC ($U = 260.50$, $p < 0.000$), and oxygen saturation ($U = 263.00$, $p < 0.000$), with Group A showing greater improvements.*

Conclusion: *The Buteyko breathing technique, combined with conventional physical therapy, was found to be very effective in improving lung volumes and oxygen saturation in asthmatic patients. This study highlights the potential of the Buteyko technique as a superior intervention for enhancing respiratory health and managing asthma symptoms.*

Keywords: *Asthma, Buteyko Breathing Technique, Papworth Method, Pulmonary Function, Oxygen Saturation, Respiratory Therapy, Non-Pharmacological Asthma Management, Lung Volumes*

INTRODUCTION

Asthma, a chronic inflammatory disorder of the lungs, is marked by bronchial hyperresponsiveness and reversible airway obstruction. This condition significantly impairs the quality of life for those affected, manifesting through symptoms such as cough, chest tightness, sneezing, and shortness of breath. The diagnosis

*Corresponding Author: ahsanilyas225@gmail.com
Authors' and timeline information is given at end of article.

© Open Access
This article is licensed under a Creative Commons Attribution 4.0 International License, which allows use, sharing, adaptation, distribution, and reproduction in any medium or format, with appropriate credit to the original author(s). and source, a link to the license, and indication of changes. If material is not covered by the license, permission from the copyright holder is required. More details are available at "Creative Commons License" or "Public Domain Dedication".

of asthma lacks a gold standard, often relying instead on the evaluation of pulmonary volumes, specifically Forced Vital Capacity (FVC), Forced Expiratory Volume in 1 second (FEV1), and the FEV1/FVC ratio. A decrease in these respiratory volumes typically indicates an escalation in disease severity. The Global Initiative for Asthma (GINA) defines asthma as a heterogeneous disease characterized by a history of respiratory symptoms and expiratory airflow limitation. Despite extensive research, the exact pathophysiology of asthma remains elusive, though it is commonly associated with allergic reactions (1, 2).

Asthma is a prevalent condition, affecting over 300 million individuals worldwide, thereby constituting a significant public health challenge. Its prevalence is notably higher in industrialized nations compared to middle- and low-income countries, a disparity attributed to lifestyle and environmental changes driven by rapid industrialization (3, 4). Risk factors for asthma include tobacco smoke exposure, vitamin D deficiency, air pollution, a history of bronchitis or pneumonia during childhood, allergic rhinitis, genetic predisposition, and a family history of pulmonary diseases. Age also plays a role, with advanced age often bringing comorbidities that complicate asthma management. Additionally, smoking and allergic rhinitis are well-documented risk factors (5, 6).

Asthma's heterogeneity and diverse etiology complicate its diagnosis, which often hinges on clinical evidence of periodic respiratory symptoms and reversible airway obstruction. Pulmonary function tests such as FVC, FEV1, and the FEV1/FVC ratio are crucial in identifying airflow limitation and assessing the severity of the disease (7, 8). While there is no definitive test for asthma, the combination of patient history and physical examination aids healthcare professionals in distinguishing asthma from other respiratory disorders. Asthma management typically involves both pharmacological and non-pharmacological approaches. Pharmacological treatments include bronchodilators and corticosteroids, which are essential for managing acute asthma episodes (9, 10).

Non-pharmacological treatments, particularly breathing techniques, have gained attention for their ability to improve asthma symptoms without the side effects associated with medication. Techniques such as yoga, deep breathing, pursed-lip breathing, and respiratory retraining are increasingly used to manage asthma by addressing dysfunctional breathing patterns and reducing hyperventilation (11). Among these, the Buteyko breathing technique and the Papworth method are notable for their effectiveness in improving lung volumes and oxygen saturation in asthmatic patients (12).

The Buteyko breathing technique, developed by Russian medical scientist Dr. Konstantin Buteyko in the 1950s, is based on the concept of controlling carbon dioxide levels through specific breathing exercises. This method emphasizes diaphragmatic breathing and discourages the use of accessory muscles, promoting nasal breathing to enhance air filtration and humidification (13). The technique involves three steps: control pause,

© 2023. Open Access. Licensed under CC BY 4.0.

maximum pause, and a combination of both, practiced regularly to improve pulmonary function and quality of life in asthmatic patients (14).

Conversely, the Papworth method, developed in the 1960s, combines relaxation and breathing exercises to address hyperinflation and hyperventilation in asthma patients. This method focuses on diaphragmatic breathing and slow nasal expiration, integrating these practices into daily activities to reduce symptoms and improve spirometric volumes Both techniques aim to correct abnormal breathing patterns and enhance respiratory function, providing significant benefits for asthmatic patients. Recent studies have underscored the efficacy of the Buteyko technique in managing various respiratory conditions. effectiveness in reducing depression and anxiety in post-CABG patients, highlighted its positive impact on anxiety and quality of life among college students Other studies have also shown that diaphragmatic breathing and the Buteyko technique can significantly improve pulmonary functions and voice dynamics (15).

Despite the benefits of both techniques, there has been limited research comparing the Buteyko and Papworth methods directly. This study aims to fill that gap by evaluating the comparative effects of these two breathing techniques on pulmonary functions and oxygen saturation in asthmatic patients. The findings are expected to provide valuable insights for healthcare professionals in selecting the most effective breathing interventions for managing asthma and improving patient outcomes.

MATERIAL AND METHODS

The study employed a randomized clinical trial design to evaluate the comparative effects of the Buteyko breathing technique and the Papworth method on pulmonary functions and oxygen saturation in asthmatic patients. The sample size was calculated using the OpenEpi tool, with a mean of 12.57 and variance of 1.81 for Group A, and a mean of 13.81 and variance of 1.86 for Group B. With a 95% confidence interval and a power of 0.8, the required sample size was determined to be 38, which was increased to 42 to account for a 10% attrition rate. A simple random sampling technique was utilized to select participants.

The study was conducted at Farooq Clinic Khushab over a duration of 10 months following approval from the research and ethical committee, adhering to the principles outlined in the Declaration of Helsinki. The inclusion criteria comprised diagnosed asthmatic patients aged 30-55 years, of both genders, with lung function parameters FEV1 predicted < 80% and FEV1/FVC < 75%, experiencing nighttime awakenings 3-4 times per month, and symptoms more than twice a week. Patients with unstable asthma, acute upper respiratory infections, a history of radiation therapy, oral steroid usage, or mental disorders were excluded.

Data collection involved several tools. Pulmonary function tests (PFT) were employed to measure lung functions, including FVC, FEV1, and FEV1/FVC ratios The Asthma Control Test (ACT) provided a clinical

© 2023. Open Access. Licensed under CC BY 4.0.

evaluation of asthma symptoms using a validated five-item questionnaire (49). The WHO Quality of Life (WHOQOL) questionnaire was utilized to assess participants' quality of life and well-being, with a low score indicating depression and anxiety-like symptoms. Oxygen saturation was measured using a non-invasive oximeter, which was placed on the participants' fingers (3, 5-8).

Participants were recruited after providing informed consent and were screened using the WHOQOL and ACT questionnaires. They were then randomized into two groups using the chit box method. Group A received the Buteyko breathing technique, while Group B received the Papworth method. Each group also received conventional physiotherapy in the form of bronchial drainage.

The Buteyko breathing technique was administered to Group A five times a week for 20-minute sessions over four weeks. The technique involved three steps: control pause, maximum pause, and a combination of both. Patients were instructed to perform these exercises at home twice daily, particularly two hours after meals. The Papworth method was provided to Group B for four sessions per week, each lasting 20 minutes, over four weeks. This method incorporated diaphragmatic breathing and slow nasal expiration, progressing from a semi-recumbent to a standing position over the intervention period.

Both groups received conventional physiotherapy, which included percussion, vibration, postural drainage, and coughing techniques. These were performed to clear airway passages and improve respiratory function.

Data analysis was conducted using SPSS software version 25. The normality of data was assessed using the Shapiro-Wilk test, which indicated that the data were not normally distributed ($p < 0.05$). Consequently, non-parametric tests were applied. Age was presented as mean ± standard deviation, and gender distribution was presented as frequency. The Mann-Whitney U Test was used for between-group analysis, and the Wilcoxon Signed Rank Test was employed for within-group analysis to assess changes in lung volumes (FVC, FEV1, FEV1/FVC) and oxygen saturation.

The results of the study indicated statistically significant improvements in lung volumes and oxygen saturation for both groups, with the Buteyko breathing technique demonstrating superior efficacy compared to the Papworth method. The findings provide valuable insights for the implementation of effective breathing techniques in the management and rehabilitation of asthmatic patients, contributing to enhanced pulmonary function and overall quality of life (16).

RESULTS

The study analyzed data from 42 participants, divided into two groups: Group A (Buteyko breathing technique) and Group B (Papworth method). The demographic characteristics, lung volumes, and oxygen saturation levels were assessed at baseline and after four weeks of intervention.

© 2023. Open Access. Licensed under CC BY 4.0.

The mean age of participants in Group A was 41.08 ± 6.56 years, while in Group B it was 38.90 ± 5.41 years. The gender distribution in Group A included 12 males (57.1%) and 9 females (42.9%), whereas Group B comprised 11 males (52.4%) and 10 females (47.6%).

Table 1 Demographic Characteristics

Group	Mean Age (Years) ± SD	Male	Female
Group A (Buteyko)	41.08 ± 6.56	12 (57.1%)	9 (42.9%)
Group B (Papworth)	38.90 ± 5.41	11 (52.4%)	10 (47.6%)

The Shapiro-Wilk test indicated that the data for lung volumes (FVC, FEV1, FEV1/FVC) and oxygen saturation were not normally distributed ($p < 0.05$).

Table 2 Normality Test

Variable	Shapiro-Wilk Statistic	Sig.
FEV1 Baseline	0.901	0.002
FEV1 4th Week	0.919	0.005
FVC Baseline	0.932	0.016
FVC 4th Week	0.940	0.029
FEV1/FVC Baseline	0.886	0.001
FEV1/FVC 4th Week	0.942	0.033
Oxygen Saturation Baseline	0.862	0.000
Oxygen Saturation 4th Week	0.907	0.002

The Wilcoxon Signed Rank Test revealed statistically significant improvements within each group from baseline to the 4th week for all measured variables.

Table 3 Within-Group Analysis (Wilcoxon Signed Rank Test)

Variable	Negative Ranks	Positive Ranks	Ties	Z	P Value
FEV1 Week 4 - Baseline	0	21.50 (903.00)	0	-5.691	0.000
FVC Week 4 - Baseline	0	21.50 (903.00)	0	-5.667	0.000
FEV1/FVC Week 4 - Baseline	0	21.00 (861.00)	1	-5.622	0.000
Oxygen Saturation Week 4 - Baseline	0	21.50 (903.00)	0	-5.687	0.000

The Mann-Whitney U Test demonstrated significant differences between the groups at the 2nd and 4th weeks, favoring the Buteyko breathing technique for all outcome variables.

Table 4 Between-Group Analysis (Mann-Whitney U Test)

Variable	Mean Rank	Sum of Ranks	Sig. (2-tailed)
FEV1 Baseline	19.62	412.00	0.305
FEV1 2nd Week	28.05	589.00	0.000
FEV1 4th Week	31.86	669.00	0.000
FVC Baseline	22.60	474.50	0.560

© 2023. Open Access. Licensed under CC BY 4.0.

Variable	Mean Rank	Sum of Ranks	Sig. (2-tailed)
FVC 2nd Week	26.48	556.00	0.008
FVC 4th Week	29.62	622.00	0.000
FEV1/FVC Baseline	24.24	509.00	0.130
FEV1/FVC 2nd Week	27.55	578.50	0.001
FEV1/FVC 4th Week	30.60	642.50	0.000
Oxygen Saturation Baseline	21.14	444.00	0.830
Oxygen Saturation 2nd Week	26.57	558.00	0.004
Oxygen Saturation 4th Week	30.48	640.00	0.000

The results indicate that both the Buteyko breathing technique and the Papworth method effectively improved lung volumes and oxygen saturation in asthmatic patients. However, the Buteyko technique showed greater efficacy in enhancing FVC, FEV1, FEV1/FVC, and oxygen saturation levels compared to the Papworth method. These findings provide substantial evidence supporting the implementation of the Buteyko breathing technique as a superior intervention for improving pulmonary functions and overall respiratory health in asthmatic patients.

DISCUSSION

The current study aimed to evaluate the comparative effects of the Buteyko breathing technique and the Papworth method on pulmonary functions and oxygen saturation in asthmatic patients. The results demonstrated that both techniques significantly improved lung volumes and oxygen saturation, with the Buteyko breathing technique showing superior efficacy. These findings align with previous research that highlighted the effectiveness of the Buteyko method in enhancing pulmonary function and managing asthma symptoms (16).

Emphasized the Buteyko technique's role in reducing depression and anxiety in post-CABG patients, which indirectly supports its broader application in respiratory therapy (17) Found a positive relationship between Buteyko training and reduced anxiety levels among college students, further validating the psychological benefits of this breathing technique (18) These psychological improvements could contribute to better asthma management, as anxiety and stress often exacerbate asthma symptoms.

The study's results were consistent with findings who compared the Buteyko technique with balloon blowing and reported significant improvements in expiratory peak flow in the Buteyko group (19).explored the impact of combined breathing and aerobic exercises on pulmonary function, concluding that breathing exercises alone, such as the Buteyko technique, had a substantial positive effect on lung volumes (20). This study's findings also resonate with the who demonstrated that the Buteyko technique significantly improved chest expansion and quality of life in asthmatic patients.

© 2023. Open Access. Licensed under CC BY 4.0.

The Papworth method, although effective, showed less pronounced improvements compared to the Buteyko technique. This is in line with who indicated that various breathing exercises, including the Papworth method, are beneficial but may not be as impactful as the Buteyko technique in terms of improving lung function and reducing symptoms The comprehensive approach of the Buteyko technique, which includes diaphragmatic breathing, nasal breathing, and breath-hold exercises, likely accounts for its superior efficacy.

One of the study's strengths was the randomized clinical trial design, which minimized bias and ensured robust results. The use of validated tools such as the PFT, ACT, WHOQOL, and oximeter for data collection further strengthened the study's credibility. However, the study had several limitations. The intervention period was relatively short, potentially underestimating the long-term benefits of both techniques. Additionally, the sample size, while adequate, could be expanded in future studies to enhance generalizability. Non-adherence to the intervention protocol by some participants may have also affected the results, highlighting the need for stricter adherence monitoring in future research (21).

The study suggested that older adults should be included in future research to evaluate the efficacy of breathing techniques across different age groups. A longer follow-up period is recommended to assess the sustained effects of the Buteyko and Papworth methods on pulmonary functions and quality of life. Moreover, future studies should explore the integration of these breathing techniques with other non-pharmacological interventions to provide a comprehensive asthma management strategy.

CONCLUSION

In conclusion, the Buteyko breathing technique was found to be more effective than the Papworth method in improving lung volumes and oxygen saturation in asthmatic patients. This study contributes to the growing body of evidence supporting the use of breathing exercises as a complementary approach in asthma management. The findings underscore the importance of incorporating the Buteyko technique into rehabilitation programs for asthmatic patients to enhance their respiratory health and overall quality of life.

REFERENCES

1. Cooper S, Oborne J, Newton S, Harrison V, Thompson Coon J, Lewis S, et al. Effect of two breathing exercises (Buteyko and pranayama) in asthma: a randomised controlled trial. Thorax. 2003;58(8):674-9.

2. Kil N, Zhu JF, VanWagnen C, Abdulhamid I. The effects of midazolam on pediatric patients with asthma. Pediatric dentistry. 2003;25(2):137-42.

3. Holloway EA, West RJ. Integrated breathing and relaxation training (the Papworth method) for adults with asthma in primary care: a randomised controlled trial. Thorax. 2007;62(12):1039-42.

© 2023. Open Access. Licensed under CC BY 4.0.

4. Kaya Z, Turktas I. Correlation of clinical score to pulmonary function and oxygen saturation in children with asthma attack. Allergologia et immunopathologia. 2007;35(5):169-73.

5. Laforest L, El Hasnaoui A, Pribil C, Ritleng C, Schwalm MS, Van Ganse E. Asthma patients' perception of their ability to influence disease control and management. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2009;102(5):378-84.

6. Burgess J, Ekanayake B, Lowe A, Dunt D, Thien F, Dharmage SC. Systematic review of the effectiveness of breathing retraining in asthma management. Expert review of respiratory medicine. 2011;5(6):789-807.

7. Sharma B, Feinsilver S, Owens RL, Malhotra A, McSharry D, Karbowitz S. Obstructive airway disease and obstructive sleep apnea: effect of pulmonary function. Lung. 2011;189(1):37-41.

8. Prem V, Sahoo RC, Adhikari P. Comparison of the effects of Buteyko and pranayama breathing techniques on quality of life in patients with asthma - a randomized controlled trial. Clinical rehabilitation. 2013;27(2):133-41.

9. Sankar J, Das RR. Asthma - A Disease of How We Breathe: Role of Breathing Exercises and Pranayam. Indian journal of pediatrics. 2018;85(10):905-10.

10. Butler MW, O'Reilly A, Dunican EM, Mallon P, Feeney ER, Keane MP, et al. Prevalence of comorbid asthma in COVID-19 patients. The Journal of allergy and clinical immunology. 2020;146(2):334-5.

11. Lin CW, Huang HY, Chung FT, Lo CY, Huang YC, Wang TW, et al. Emphysema-Predominant COPD Had a Greater 5-Year Mortality and a Worse Annual Decline in Lung Function Than Airway Obstruction-Predominant COPD or Asthma at Initial Same Degree of Airflow Obstruction. Medicina (Kaunas, Lithuania). 2021;57(11).

12. Wenzel SE. Severe Adult Asthmas: Integrating Clinical Features, Biology, and Therapeutics to Improve Outcomes. American journal of respiratory and critical care medicine. 2021;203(7):809-21.

13. Brînduș GM, Marcu EA, Olteanu M, Trăistaru MR. Positive Effects of Pulmonary Rehabilitation Among Patients with Obstructive Ventilatory Dysfunction Post COVID-19. Current health sciences journal. 2022;48(4):426-35.

14. Hamad SH, Hadi AH, Mohr M, Mahadevan SP, Kzar MH. The Effect of Threshold Loading Training and an Innovative Respiratory Training Devices with Lower Torso Sports Training in Asthma Patients: A Randomized Trial. BioMed research international. 2023;2023:3049804.

© 2023. Open Access. Licensed under CC BY 4.0.

15. Kadam S, Prem V, Ughreja RA. Effect of breathing re-training on end-tidal carbon-di-oxide in patients with asthma: a systematic review and meta-analysis. The Journal of asthma : official journal of the Association for the Care of Asthma. 2023;60(8):1493-502.

16. Kaminsky DA, He J, Henderson R, Dixon AE, Irvin CG, Mastronarde J, et al. Bronchodilator response does not associate with asthma control or symptom burden among patients with poorly controlled asthma. Respiratory medicine. 2023;218:107375.

17. Singh SJ, Baldwin MM, Daynes E, Evans RA, Greening NJ, Jenkins RG, et al. Respiratory sequelae of COVID-19: pulmonary and extrapulmonary origins, and approaches to clinical care and rehabilitation. The Lancet Respiratory medicine. 2023;11(8):709-25.

18. Valero-Moreno S, Montoya-Castilla I, Pérez-Marín M. Quality of life in patients with asthma: Medical indicators and psychological variables. Journal of pediatric nursing. 2023;69:e136-e44.

19. Xu J, Rathkopf MM. The cost of medication costs: Cost-related medication nonadherence in patients with asthma in the United States. Annals of allergy, asthma & immunology : official publication of the American College of Allergy, Asthma, & Immunology. 2023;131(5):538-9.

20. Spinou A, Hererro-Cortina B, Aliberti S, Goeminne PC, Polverino E, Dimakou K, et al. Airway clearance management in people with bronchiectasis: data from the European Bronchiectasis Registry (EMBARC). The European respiratory journal. 2024;63(6).

21. Vagedes K, Kuderer S, Ehmann R, Kohl M, Wildhaber J, Jörres RA, et al. Effect of Buteyko breathing technique on clinical and functional parameters in adult patients with asthma: a randomized, controlled study. European journal of medical research. 2024;29(1):42.

Authors and Affiliations:

1. **Ahsan Ilyas**; MS MSK; Lecturer; ahsanilyas225@gmail.com; Avicenna Medical, Lahore, Pakistan
2. **Junood Ahmad**; DPT, CHPE; Physiotherapist; junoodahmad88@gmail.com; Shalamar, Lahore, Pakistan
3. **Farah Khalid**; Lecturer; iamfarahkhalid786@gmail.com; University of Management and Technology, Lahore, Pakistan

Timeline:
Received: April 3, 2024
Accepted: April 29, 2024
Scheduled for Publication: June 3, 2024

© 2023. Open Access. Licensed under CC BY 4.0.