Original Research Paper

Volume - 16 | Issue - 08 | August - 2026 | PRINT ISSN No. 2249 - 555X | DOI : 10.36106/ijar

Physiotherapy

EFFECT OF BUTEYKO BREATHING TECHNIQUE AS AN ADJUNCT TO CONVENTIONAL THERAPY ON PEAK EXPIRATORY FLOW RATE, CARDIORESPIRATORY ENDURANCE AND QUALITY OF LIFE IN CHILDREN WITH ASTHMA: A COMPARATIVE STUDY.

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ABSTRACT Asthma is a common chronic respiratory disease in children that affects pulmonary function, exercise tolerance, and quality of life. This randomized comparative study evaluated the effectiveness of the Buteyko Breathing Technique as an adjunct to conventional physiotherapy compared with conventional physiotherapy alone in 48 children with asthma over four weeks. Participants received treatment twice weekly, and outcomes including peak expiratory flow rate (PEFR), cardiorespiratory endurance (3-minute KPR test), and pediatric asthma quality of life (PAQLQ) were assessed at baseline, the 2nd week, and the 4th week. Both groups showed significant improvements; however, the Buteyko group demonstrated significantly greater gains in pulmonary function, heart rate recovery, and quality of life ($p < 0.05$). These findings suggest that the Buteyko Breathing Technique is a safe, cost-effective, and beneficial adjunct to conventional physiotherapy for improving asthma outcomes in children.

KEYWORDS : Asthma, Buteyko Breathing Technique, Conventional Physiotherapy, Peak Expiratory Flow Rate (PEFR), Cardiorespiratory Endurance, Quality of Life.

INTRODUCTION

Asthma is one of the most common chronic respiratory diseases in childhood, affecting approximately 7–10% of children worldwide. In 2019, it affected around 262 million people and caused nearly 455,000 deaths globally, while allergic disorders occur in 30–35% of children, with asthma being the most prevalent. [1–3]

Asthma is characterized by chronic airway inflammation, bronchial hyperresponsiveness, and variable airflow limitation, leading to recurrent symptoms such as wheezing, cough, chest tightness, and breathlessness. Altered breathing mechanics and respiratory muscle dysfunction may further compromise ventilation, resulting in reduced physical capacity, poorer quality of life, and increased healthcare utilization when the disease is inadequately controlled. [4,5]

The condition frequently begins in early childhood and is influenced by genetic and environmental factors. Recurrent wheezing episodes during infancy may progress to persistent asthma, while children aged 6–12 years often experience symptoms triggered by allergens and exercise. Exercise-induced bronchoconstriction during this period can restrict physical activity and negatively affect emotional and social development. [5–7]

Asthma is also associated with school absenteeism, reduced participation in sports, and psychological distress, accounting for more than 10 million missed school days annually. Repeated exacerbations may contribute to long-term impairment in lung function and increase the risk of chronic respiratory disease later in life, highlighting the importance of timely diagnosis and effective management. [2,6–8]

Current asthma management combines pharmacological therapy with non-pharmacological interventions. Medications such as bronchodilators, corticosteroids, β-agonists, and leukotriene receptor antagonists are effective in controlling symptoms, although poor adherence and incorrect inhaler technique remain common barriers. Conventional physiotherapy—including breathing control, pursed-lip breathing, relaxation, chest mobility exercises, and endurance training—helps improve ventilation, respiratory muscle performance, and breathing efficiency, with evidence supporting better outcomes when combined with medical treatment. [4–6,8–10]

The Buteyko Breathing Technique (BBT), developed by Konstantin Buteyko in 1952, is a breathing retraining method based on reducing hyperventilation through controlled breathing and nasal respiration. The technique aims to normalize carbon dioxide levels, reduce airway overinflation, and improve respiratory function. Previous studies have reported improvements in asthma symptoms, peak expiratory flow rate (PEFR), control pause, medication use, and quality of life following BBT. [4,6,7,11,12]

Despite growing evidence supporting BBT in asthma management, studies involving children remain limited. Therefore, this study aimed to compare the effects of Buteyko Breathing Technique combined with conventional physiotherapy versus conventional physiotherapy alone on peak expiratory flow rate, cardiorespiratory endurance, and quality of life in children with asthma.

OBJECTIVES

1. To compare the effects of Buteyko breathing technique as an adjunct to conventional therapy vs. conventional therapy alone on peak expiratory flow rate using peak flow meter in children with asthma in 4 weeks.

2. To compare the effects of Buteyko breathing technique as an adjunct to conventional therapy vs. conventional therapy alone on cardiorespiratory endurance using 3-min Kasch Pulse Recovery Test [9] in children with asthma in 4 weeks.

3. To compare the effects of Buteyko breathing technique as an adjunct to conventional therapy vs. conventional therapy alone on quality of life using Pediatric Asthma Quality of life Questionnaire [18] in children with asthma in 4 weeks.

MATERIALS

Standard wright peak flow meter, 12 - inch stepper, stopwatch, measuring tape, pulse oximeter, Childhood asthma control test, Paediatric Asthma Quality of life Questionnaire.

METHODOLOGY

1. Study Design: Randomized comparative experimental study
2. Study Setting: Tertiary health care centre and private paediatric clinics
3. Participants: n = 48

Inclusion criteria

- Physically active asthmatic children aged 6–12 years. [4,10]
- Both males and females included.
- Mild to moderate asthma, assessed using the Childhood Asthma Control Test (CACT) [11] and confirmed by a medical practitioner.
- Asthma managed with oral or inhaled medications only.
- Willingness of children and parents to participate in the 4-week study.

Exclusion criteria

- Use of oral steroids during the 4-week intervention.
- Change in inhaled steroid type or dose.
- Unstable medical conditions (e.g., cardiac disease, pneumonia, infectious lung disease, physical or mental disorders).
- Receiving other alternative therapies.

Subject withdrawal criteria - Patient is unable to comply with the training program.

Termination criteria: Shortness of breath, dizziness and/or chest discomfort or pain.

Study Duration: 1 year

Randomization: Simple random sampling

INTERVENTION

Group A (Buteyko Breathing + Conventional Therapy): The child was seated comfortably in an upright position and asked to breathe through the nose. After a small inhalation (2s) followed by a small exhalation (3s), the nose was pinched to hold the breath while the therapist recorded the control pause time. The child resumed breathing at the first urge to breathe. This exercise was performed 12 times daily (4 in the morning, 4 in the afternoon, and 4 in the evening). [3,6]

Figure 1: Subject performing Buteyko breathing

Group B (Only Conventional Therapy):

Children performed deep breathing exercises (pursed-lip breathing and breathing control) for 2 sets of 5 repetitions. Chest mobility exercises (back arch, shoulder pinch, shoulder depression, chin tuck, side bends, trunk rotations, cat-camel, and pectoral stretch held for 10 seconds) and thoracic expansion exercises were practiced for 2 sets of 10 repetitions. Children were also taught dyspnoea-relieving positions to use when experiencing breathlessness after physical activity.[22,29]

STATISTICALANALYSIS

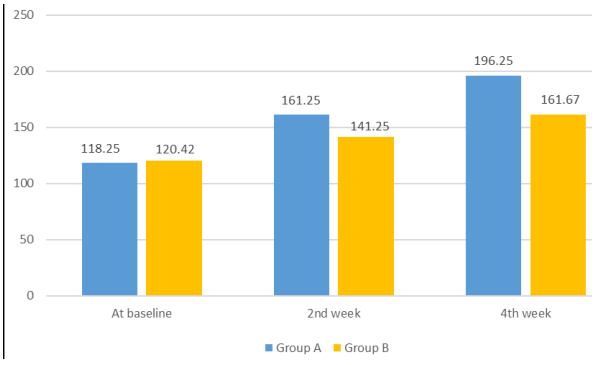
Data were entered into Microsoft Excel, and mean and standard deviation were calculated for demographic parameters and outcome measures. Statistical analysis was performed using SPSS version 23. The Shapiro–Wilk test confirmed normal distribution of the data ($p > 0.05$). Repeated measures ANOVA was used to analyse within-group and between-group differences, followed by post hoc tests for comparisons across time intervals. A p-value < 0.05 was considered statistically significant at a 95% confidence interval.

RESULTS

An unpaired t-test revealed no significant difference between the groups indicating both groups were comparable with respect to age and height. The total number of participants were 48, with 25 females and 23 males overall.

Peak expiratory flow rate (PEFR)

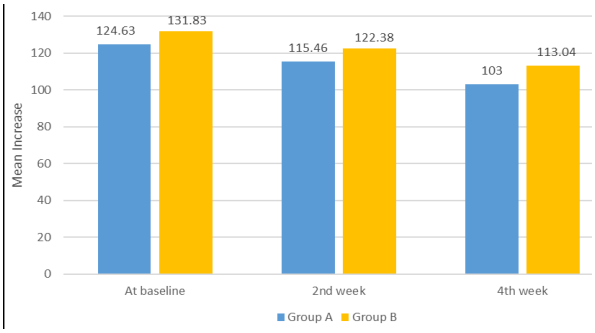
Graph 1 - PEFR mean comparision over time



From baseline to the 2nd week, Group A demonstrated a 36.3% increase, while Group B showed a 17.3% increase. From the 2nd to the 4th time point, Group A further improved by 21.7%, whereas Group B exhibited a 14.5% increase, with a statistically significant difference ($p = 0.0215$). Post hoc analysis showed that Group A consistently outperformed by 31.31% than Group B in PEFR improvement, suggesting a more effective intervention.

3-minute KPR test

Graph 2 – Post test mean heart rate comparison



From baseline to the 2nd week, Group A demonstrated a 7.36% reduction, while Group B showed a 7.15% reduction. From the 2nd to the 4th week, Group A further reduced heart rate by 10.78, whereas Group B showed a 7.63% reduction. Overall, from baseline to the 4th week, Group A achieved a 17.38% decrease, while Group B showed a 14.26% decrease in heart rate. Over time, Group A demonstrates a more pronounced decline in heart rate by 3.12%, suggesting greater effectiveness of the intervention in reducing heart rate over time.

PAQLQ

Symptoms domain :

The PAQLQ Symptoms domain showed significant improvement over time in both groups (Repeated Measures ANOVA, $p < 0.05$). Although both groups demonstrated improved symptom-related quality of life, the improvement was greater in Group A than in Group B, with an overall increase of 56.99% versus 33.44%, respectively.

Activity limitations domain :

The PAQLQ Activity Limitation domain improved significantly in both groups ($p < 0.05$). Group A showed greater improvement than Group B, with an overall increase of 51.51% versus 24.29%, respectively.

Emotional functions domain :

The PAQLQ Emotional Function domain improved significantly in both groups ($p < 0.05$). Group A demonstrated greater improvement than Group B, with an overall increase of 54.09% compared to 29.42%, respectively.

DISCUSSION

This study compared the effects of the Buteyko Breathing Technique (BBT) combined with conventional physiotherapy and conventional physiotherapy alone on pulmonary function, cardiorespiratory endurance, and quality of life (QOL) in children with asthma over four weeks. Although both groups showed significant improvements, the gains were consistently greater in the BBT group ($p < 0.05$), demonstrating the additional therapeutic benefit of incorporating breathing retraining into conventional physiotherapy.

The beneficial effects of BBT may be explained by its ability to reduce chronic hyperventilation, restore arterial carbon dioxide (CO_2) levels, promote bronchodilation, improve oxygen delivery through the Bohr effect, and reduce airway hyperresponsiveness. In addition, controlled nasal and diaphragmatic breathing enhances nitric oxide release, improves respiratory efficiency, and promotes parasympathetic activity, thereby reducing bronchospasm and improving breathing control. [4,30–32]

The demographic characteristics confirmed that both groups were comparable at baseline in terms of age, height, and gender distribution, minimizing the likelihood that baseline differences influenced the outcomes.

PEFR improved significantly in both groups; however, the improvement was greater in Group A. Overall PEFR increased by

62.6% in Group A compared with 31.3% in Group B ($p = 0.0215$), indicating that BBT provided additional improvement in pulmonary function. Reduced hyperventilation, improved breathing control, and mild CO_2 retention may have contributed to these findings. [4,31] Similar improvements have been reported by Hassan et al. (2022) and Courtney et al. (2017), while studies by Khan et al. (2012) and Garagorri et al. (2022) also support the beneficial role of physiotherapy in improving pulmonary function and asthma outcomes. [4,31,34]

Cardiorespiratory endurance, assessed using the 3-minute KPR test, also improved in both groups, with a greater reduction in heart rate in Group A (17.38%) than in Group B (14.26%). The superior improvement may be related to enhanced autonomic regulation and parasympathetic activation induced by slow breathing. Previous studies have similarly reported improvements in heart-rate recovery, exercise tolerance, and cardiorespiratory function following breathing retraining and exercise interventions in children with asthma. [4,24,35,36]

Quality of life improved significantly across all PAQLQ domains in both groups, with consistently greater gains in Group A. Symptom scores improved by 56.99% in Group A compared with 33.44% in Group B, activity limitation by 51.51% versus 24.29%, and emotional function by 54.09% versus 29.42%. These findings suggest that better breathing control not only improves respiratory symptoms but also enhances daily activity participation and emotional well-being. Similar improvements have been reported in recent clinical studies and systematic reviews evaluating Buteyko breathing and exercise-based interventions in paediatric asthma. [4,25,31,36–42]

Overall, symptom improvement was the most pronounced, followed by activity limitation and emotional function, suggesting that improved symptom control facilitates greater physical participation and subsequently enhances emotional health. [43]

The findings of this study reject the null hypothesis and support the alternate hypothesis, demonstrating that although conventional physiotherapy effectively improves asthma outcomes, the addition of the Buteyko Breathing Technique provides significantly greater improvements in pulmonary function, cardiorespiratory endurance, and quality of life in children with asthma.

CONCLUSION

This study concludes that using Buteyko breathing technique as an adjunct to conventional physiotherapy yields better results than conventional physiotherapy alone on pulmonary function (PEFR), cardiopulmonary endurance, and quality of life in children with asthma over a period of 4 weeks.

LIMITATIONS

Short follow-up duration may not show long-term effects.
PAQLQ self-reports may cause response bias.

Future Scope

- Age-stratified studies can enhance accuracy and generalizability of findings.
- Larger, multicenter trials are needed to confirm the applicability of findings.
- Incorporating psychosocial support to enhance emotional well-being.

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