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Effectiveness of Breathing Control and Pursed Lip Breathing on Dyspnea and Ventilatory Function in Acute Asthma Exacerbation: A Case Report

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Abstract
Background: Acute asthma exacerbation is characterized by bronchoconstriction, airway inflammation, mucus hypersecretion, and increased work of breathing, which may lead to dyspnea and impaired ventilatory function. Respiratory physiotherapy has increasingly been used as a complementary intervention to improve breathing efficiency and reduce respiratory distress in patients with asthma exacerbation.
Objective: This study aimed to evaluate the effectiveness of combined breathing control and pursed lip breathing on dyspnea and ventilatory function in a patient with acute asthma exacerbation.
Methods: A longitudinal case study was conducted in a 36-year-old female patient with acute asthma exacerbation at RS Paru Respira. The patient received respiratory physiotherapy interventions consisting of infrared therapy, upper trapezius muscle release, breathing control, and pursed lip breathing over three treatment sessions. Outcomes were evaluated using thoracic expansion measurements, peak expiratory flow (PEF), inspiratory capacity assessed by Voldyne, Borg Dyspnea Scale, and auscultation findings.
Results: Thoracic expansion improved in all measurement areas, with axillary expansion increasing from 1.5 cm to 2.5 cm, fifth intercostal space expansion from 0.9 cm to 2.1 cm, and xiphoid expansion from 1.2 cm to 1.8 cm. Peak expiratory flow increased from 110 L/min to 140 L/min, while inspiratory capacity improved from 700 mL to 1000 mL. Borg Dyspnea Scale scores decreased from 7 to 4, indicating reduced dyspnea severity. No adverse events were observed during intervention.
Conclusion: Combined breathing control and pursed lip breathing were associated with improvements in dyspnea and ventilatory function in acute asthma exacerbation. However, further controlled studies are required to confirm these findings.

Keywords
Asthma; Dyspnea; Breathing Exercises; Pulmonary Rehabilitation; Respiratory Therapy; Pursed Lip Breathing

Introduction

Asthma is a chronic inflammatory airway disease characterized by bronchial hyperresponsiveness, reversible airflow obstruction, and recurrent respiratory symptoms, including wheezing, chest tightness, cough, and dyspnea. Acute asthma exacerbation represents a worsening phase of the disease associated with intensified airway inflammation, bronchospasm, mucus hypersecretion, and increased respiratory workload, which may substantially impair pulmonary ventilation and functional capacity. During exacerbation episodes, airflow limitation may result in air trapping and dynamic hyperinflation, thereby increasing the use of accessory respiratory muscles and reducing ventilatory efficiency. These pathophysiological changes frequently contribute to progressive dyspnea, respiratory fatigue, impaired exercise tolerance, and decreased quality of life.[1]

Asthma continues to impose a substantial global health burden. According to the Global Initiative for Asthma (GINA), asthma affects more than 260 million individuals worldwide and remains a major contributor to emergency visits and hospitalization.[2] Recurrent exacerbations are associated with increased healthcare utilization, impaired quality of life, and reduced productivity. In Indonesia, asthma remains one of the most common chronic respiratory disorders requiring recurrent medical treatment and long-term management.[3] Despite advances in pharmacological therapy, acute exacerbation episodes continue to occur and frequently result in functional limitations due to persistent dyspnea and impaired ventilatory mechanics.

The management of acute asthma exacerbation generally focuses on pharmacological therapy such as bronchodilators and systemic corticosteroids. However, non-pharmacological interventions such as respiratory physiotherapy have increasingly been recognized as complementary approaches to optimize respiratory mechanics, reduce dyspnea, and improve breathing efficiency. Respiratory physiotherapy aims to facilitate alveolar ventilation, decrease respiratory muscle overactivity, improve thoracic mobility, and enhance breathing coordination. Breathing exercises administered by physiotherapists have been shown to improve asthma control and quality of life in patients receiving specialist care.[4]

Inspiratory muscle training has also been reported to improve respiratory muscle strength and ventilatory capacity in adults with stable asthma.[5] Furthermore, systematic reviews have demonstrated that respiratory muscle training significantly improves maximal inspiratory pressure and pulmonary function parameters in patients with asthma.[6] These findings suggest that respiratory exercises have a strong physiological basis for improving ventilatory efficiency and reducing airway obstruction severity.

Integrative exercise approaches, including combinations of aerobic and breathing exercises, have also demonstrated beneficial effects on asthma control, functional capacity, and quality of life.[7] Other integrative reviews have reported that physical training in patients with asthma contributes to improved ventilatory mechanisms, reduced systemic inflammation, and enhanced exercise tolerance.[8] Moreover, recent overviews of systematic reviews have concluded that structured physical activity effectively improves asthma control and aerobic capacity.[9] These findings further support the physiological rationale for respiratory exercise interventions in asthma management.

Among the available respiratory physiotherapy techniques, breathing control and pursed lip breathing have received considerable attention because of their physiological effects on respiratory mechanics. Breathing control emphasizes relaxed diaphragmatic breathing with controlled respiratory rhythm to reduce hyperventilation and excessive accessory muscle activity. Meanwhile, pursed lip breathing prolongs expiratory time and generates positive expiratory pressure, which may help prevent premature airway collapse and reduce air trapping during expiration.[10] These mechanisms are particularly relevant in acute asthma exacerbation, where dynamic hyperinflation and expiratory airflow limitation commonly occur. Compared with other respiratory techniques such as diaphragmatic breathing or Active Cycle of Breathing Technique (ACBT), the combination of breathing control and pursed lip breathing may provide a simpler and more tolerable intervention during acute respiratory distress because both techniques can be performed gradually with minimal physical demand.

In the context of case reports, respiratory physiotherapy interventions such as Active Cycle of Breathing Technique (ACBT) have also been reported to reduce dyspnea severity and improve thoracic expansion in patients with bronchial asthma.[11] Other case reports have demonstrated that multimodal respiratory physiotherapy management contributes to clinical improvement in asthma patients.[12] In addition, the combination of inspiratory muscle training and breathing retraining has been associated with improved pulmonary capacity and reduced asthma symptoms in case-based asthma management.[13]

Nevertheless, evidence regarding comprehensive respiratory physiotherapy management during acute asthma exacerbation remains limited, particularly studies involving serial monitoring of objective ventilatory parameters such as thoracic expansion, peak expiratory flow, inspiratory capacity, and dyspnea scores. Current evidence predominantly focuses on stable asthma conditions, whereas physiotherapy implementation during the acute exacerbation phase remains insufficiently explored. Moreover, limited reports have evaluated the combined application of breathing control and pursed lip breathing using multiple clinical outcome measures in acute clinical settings.

Therefore, this case study aimed to evaluate the effectiveness of combined breathing control and pursed lip breathing interventions on dyspnea and pulmonary ventilatory function in a patient with acute asthma exacerbation. Serial evaluation was conducted using thoracic expansion measurement, peak expiratory flow, inspiratory capacity assessment, and Borg Dyspnea Scale to provide a comprehensive clinical overview of the patient's ventilatory response following respiratory physiotherapy intervention.

Methods

This study employed a longitudinal case study design to evaluate the clinical response to respiratory physiotherapy intervention in a patient with acute asthma exacerbation. A case study approach was considered appropriate because it allowed detailed and sequential observation of changes in respiratory symptoms and ventilatory function during the intervention period. The study was conducted at RS Paru Respira between March and April 2025.

The subject was a 36-year-old female patient diagnosed with acute asthma exacerbation by a pulmonologist and undergoing inpatient treatment. The patient presented with complaints of dyspnea, increased respiratory rate, use of accessory respiratory muscles, reduced thoracic expansion, decreased peak expiratory flow, and impaired inspiratory capacity. Inclusion criteria consisted of: (1) adult patients aged ≥18 years; (2) confirmed diagnosis of acute asthma exacerbation; (3) presence of dyspnea and impaired ventilatory function; and (4) willingness to participate in the study. Exclusion criteria included: (1) concomitant respiratory disorders unrelated to asthma, such as pneumonia or chronic obstructive pulmonary disease; (2) unstable hemodynamic condition; (3) inability to follow breathing exercise instructions; and (4) absence from scheduled intervention sessions.

Before participation, the patient received a detailed explanation regarding the objectives of the study, physiotherapy procedures, outcome measurements, potential benefits, and patient rights during the intervention process. Written informed consent was obtained from the patient prior to data collection and publication of the clinical information. Patient confidentiality and anonymity were strictly maintained throughout the study.

This manuscript was prepared as a single-case study based on routine clinical physiotherapy management without experimental intervention or modification of standard medical treatment. Therefore, formal ethical clearance was not required according to institutional policy. Nevertheless, all procedures were conducted in accordance with the ethical principles outlined in the Declaration of Helsinki.

Baseline clinical examination was performed prior to intervention. Initial assessment included respiratory rate, heart rate, blood pressure, oxygen saturation (SpO_2), thoracic expansion, peak expiratory flow, inspiratory capacity, auscultation findings, and dyspnea severity using the Borg Dyspnea Scale. The patient also underwent standard pharmacological management prescribed by the attending physician, including bronchodilator and corticosteroid therapy. Because pharmacological treatment may influence ventilatory improvement during acute exacerbation, the physiotherapy outcomes in this study were interpreted as complementary to standard medical management rather than independent therapeutic effects.

The respiratory physiotherapy intervention was administered over three treatment sessions (T1–T3). Each session consisted of infrared therapy, upper trapezius muscle release, breathing control exercises, and pursed lip breathing exercises. Interventions were delivered according to the FITT principle (frequency, intensity, time, and type) and adjusted to the patient's tolerance and clinical condition during each treatment session. Continuous monitoring was performed throughout intervention sessions to observe signs of respiratory distress, excessive fatigue, dizziness, oxygen desaturation, or worsening dyspnea.

Infrared therapy was administered to facilitate muscle relaxation and reduce upper thoracic muscle tension associated with increased respiratory effort. The infrared device was positioned approximately 45–50 cm from the target area over the upper thoracic and upper trapezius regions for 15 minutes using continuous mode. The patient was placed in a comfortable sitting position during therapy. No adverse skin reactions or thermal discomfort were observed during intervention.

Upper trapezius muscle release was subsequently performed to reduce muscle tension associated with accessory respiratory muscle overactivity. The patient was positioned in sitting with relaxed shoulder posture. Soft tissue release techniques consisted of effleurage and friction applied to the right upper trapezius muscle for approximately 10 minutes using moderate manual pressure adjusted to patient tolerance.

Breathing control exercises were performed in a sitting or semi-Fowler position to facilitate relaxed diaphragmatic breathing and reduce rapid shallow breathing patterns. The patient was instructed to inhale slowly through the nose and exhale gently through the mouth while minimizing excessive upper chest movement. Each breathing cycle was performed in a relaxed rhythm to reduce respiratory muscle overactivity and improve breathing efficiency. The exercise protocol consisted of five repetitions per set for three sets, with approximately one-minute rest intervals between sets. Total exercise duration was approximately 10–15 minutes per session.

Pursed lip breathing exercises were then performed to prolong expiratory time and reduce expiratory airflow limitation. The patient was instructed to inhale through the nose for approximately two seconds and exhale slowly through pursed lips for approximately four seconds. The intervention aimed to improve expiratory control and reduce air trapping during breathing. Similar to breathing control exercises, pursed lip breathing was performed for five repetitions in three sets. The patient was additionally instructed to continue the exercise independently two to three times daily outside supervised therapy sessions.

Clinical evaluation was conducted before and after each treatment session. Thoracic expansion was measured using a measuring tape at three anatomical levels: axillary region, fifth intercostal space (ICS 5), and xiphoid process. Measurements were recorded as the difference between maximal inspiration and maximal expiration in centimeters. Peak expiratory flow was assessed using a peak flow meter and recorded in liters per minute (L/min). Inspiratory capacity was evaluated using a Voldyne incentive spirometer and documented in milliliters (mL). Dyspnea severity was assessed using the Borg Dyspnea Scale, which is a valid and widely used instrument for subjective evaluation of breathlessness during respiratory disorders.[14] Auscultation examination was performed to evaluate the presence and distribution of additional breath sounds such as wheezing or rhonchi.

The clinical management pathway began with the patient's presentation with an acute asthma exacerbation, followed by medical assessment and confirmation of the diagnosis by a pulmonologist. A baseline physiotherapy examination was then conducted to assess vital signs, thoracic expansion, peak expiratory flow, inspiratory capacity, dyspnea severity, and auscultation findings. Standard pharmacological management was provided alongside the respiratory physiotherapy program. The sequence of baseline assessment, pharmacological management, respiratory physiotherapy intervention, serial evaluation, and final outcome interpretation is presented in Figure 1.

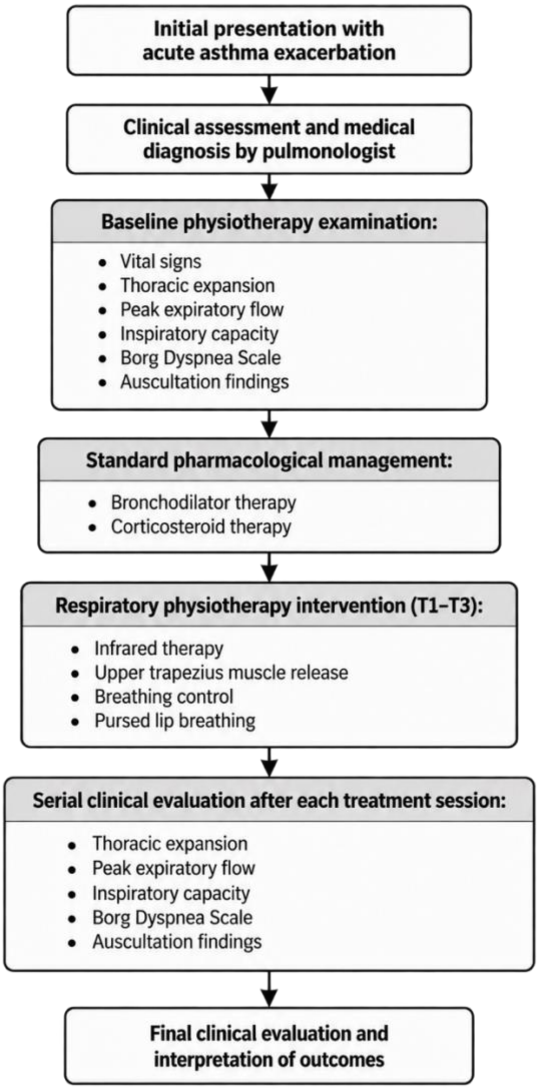

Figure 1. Timeline of Clinical Management and Respiratory Physiotherapy Intervention

Data analysis was performed descriptively because this study involved a single-case design. Changes in clinical outcomes were evaluated using serial trend analysis and percentage improvement between baseline and final intervention sessions. Outcome trends were interpreted clinically to evaluate changes in ventilatory function, thoracic mobility, inspiratory capacity, and dyspnea severity throughout the intervention period. No inferential statistical analysis was performed because of the single-subject design.

Results

A 36-year-old female patient diagnosed with acute asthma exacerbation underwent respiratory physiotherapy intervention consisting of infrared therapy, upper trapezius muscle release, breathing control, and pursed lip breathing over three treatment sessions (T1–T3). Baseline clinical findings demonstrated dyspnea, increased respiratory rate, use of accessory respiratory muscles, decreased thoracic expansion, reduced peak expiratory flow, impaired inspiratory capacity, and abnormal auscultation findings. Serial evaluations were conducted before and after each intervention session to assess changes in ventilatory function and respiratory symptoms. Baseline patient characteristics and clinical findings are presented in Table 1 to provide a comprehensive overview of the patient's demographic and clinical condition prior to intervention.

Table 1. Baseline Characteristics of the Patient

Variable	Findings
Initials	Ny. L
Age	36 years
Sex	Female
Medical diagnosis	Acute asthma exacerbation
Height	158 cm
Weight	60 kg
Body mass index	24.0 kg/m²
Smoking history	Passive smoker
History of asthma	Diagnosed with asthma for 1 year, with two previous exacerbations requiring hospitalization
Current pharmacological therapy	Bronchodilator and corticosteroid therapy
Respiratory rate	18 breaths/minute
Heart rate	80 beats/minute
Blood pressure	110/75 mmHg
Oxygen saturation (SpO_2)	93%
Main complaints	Dyspnea, chest tightness, respiratory fatigue
Accessory muscle use	Present
Auscultation findings	Wheezing and rhonchi

Chest radiography was performed as part of the supporting clinical examination to assess the patient's thoracic and pulmonary condition during the acute asthma exacerbation. The radiographic findings from the posteroanterior chest view are presented in Figure 2.

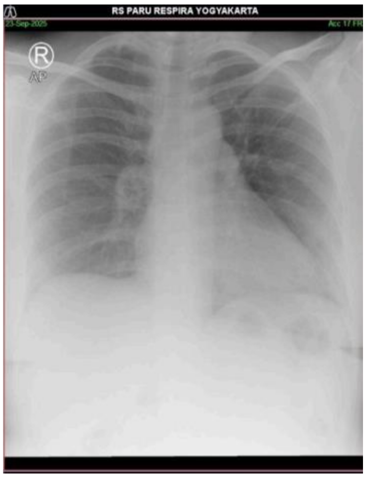

Figure 2. Chest Radiography Findings in Acute Asthma Exacerbation

Posteroanterior chest radiography demonstrated increased bronchovascular markings with no evidence of pleural effusion or diaphragmatic flattening. The costophrenic angles appeared sharp bilaterally, and the aortic contour remained within normal limits. These findings may reflect nonspecific airway changes associated with respiratory disorders; however, chest radiography alone cannot confirm airway inflammation specific to asthma exacerbation.

Serial measurements of thoracic expansion were conducted at the axillary, fifth intercostal space (ICS 5), and xiphoid levels to evaluate changes in chest wall mobility following intervention. The results are presented in Table 2.

Table 2. Serial Evaluation of Thoracic Expansion

Measurement Area	T1 Pre	T1 Post	T2 Pre	T2 Post	T3 Pre	T3 Post
Axillary region (cm)	1.5	1.7	1.5	1.7	1.9	2.5
ICS 5 (cm)	0.9	1.0	1.1	1.3	1.2	2.1
Xiphoid process (cm)	1.2	1.3	1.3	1.5	1.5	1.8

Overall, thoracic expansion increased progressively across all measurement areas during the intervention period. The greatest improvement was observed at the fifth intercostal space, where thoracic expansion increased from 0.9 cm at baseline to 2.1 cm after the final session, representing an approximate improvement of 133.3%. Axillary expansion increased from 1.5 cm to 2.5 cm, whereas xiphoid expansion increased from 1.2 cm to 1.8 cm.

Changes in expiratory airflow were evaluated using peak expiratory flow measurements. Serial peak flow results are summarized in Table 3.

Table 3. Serial Evaluation of Peak Expiratory Flow

Session	Pre-intervention	Post-intervention
T1	110 L/min	130 L/min
T2	120 L/min	140 L/min
T3	130 L/min	140 L/min

Peak expiratory flow values demonstrated gradual improvement during the intervention period. The initial value of 110 L/min indicated markedly reduced expiratory airflow compared with predicted normal adult female values. Following intervention, the final post-treatment value increased to 140 L/min, representing an approximate 27.3% improvement from baseline.

Inspiratory capacity was evaluated using the Voldyne incentive spirometer to assess ventilatory improvement throughout therapy. The results are shown in Table 4.

Table 4. Serial Evaluation of Inspiratory Capacity Using Voldyne

Session	Pre-intervention	Post-intervention	Clinical Interpretation
T1	700 mL	800 mL	Poor inspiratory capacity (<50% predicted)
T2	750 mL	1000 mL	Moderate inspiratory capacity (>60% predicted)
T3	800 mL	1000 mL	Moderate inspiratory capacity (>60% predicted)

Inspiratory capacity improved progressively during treatment sessions. The baseline inspiratory volume of 700 mL increased to 1000 mL after intervention. Clinically, the patient progressed from poor inspiratory performance toward moderate inspiratory capacity by the second and third treatment sessions.

Changes in dyspnea severity were evaluated using the Borg Dyspnea Scale. The results are presented in Table 5.

Table 5. Serial Evaluation of Dyspnea Severity Using Borg Scale

Session	Borg Scale Score	Clinical Interpretation
T1	7	Severe dyspnea interfering with activity
T2	5	Moderate dyspnea occasionally interfering
T3	4	Moderate dyspnea

Dyspnea severity decreased progressively during intervention. Borg Scale scores declined from 7 at baseline to 4 after the third treatment session, indicating a reduction in perceived breathlessness and improved breathing comfort during activity.

Serial auscultation findings were also evaluated to observe changes in respiratory sounds during intervention. Initial examination identified expiratory wheezing in the left anterior lung field and rhonchi in the right posterior lung segments. Following intervention, wheezing and rhonchi remained detectable but were reduced in intensity compared with baseline examination. No signs of worsening respiratory distress or additional abnormal breath sounds were identified during treatment sessions.

Following the respiratory physiotherapy intervention, serial assessments were conducted to monitor changes in thoracic expansion, peak expiratory flow, inspiratory capacity, dyspnea severity, and auscultation findings. These parameters demonstrated progressive clinical changes across the treatment sessions, as summarized in Figure 3.

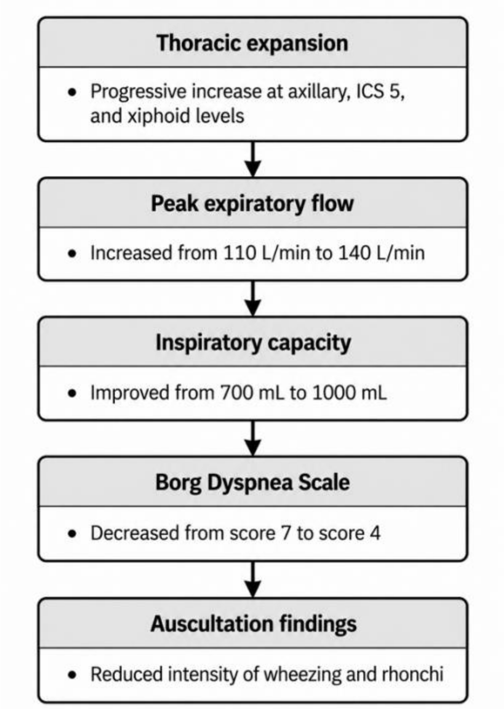

Figure 3. Clinical Trend of Respiratory Outcomes During Intervention

No adverse events, oxygen desaturation, excessive fatigue, or intolerance to respiratory physiotherapy intervention were observed throughout the treatment sessions. The patient tolerated the intervention program well and was able to complete all scheduled sessions. However, no long-term follow-up evaluation was conducted after completion of the intervention period.

Discussion

This case study demonstrated that a combination of breathing control and pursed lip breathing, integrated with supportive respiratory physiotherapy interventions, was associated with improvements in dyspnea severity, thoracic expansion, inspiratory capacity, and peak expiratory flow in a patient with acute asthma exacerbation**.** Serial evaluation across three treatment sessions revealed progressive clinical improvement, particularly in subjective dyspnea perception and thoracic mobility. These findings suggest that respiratory physiotherapy may contribute positively to ventilatory optimization during the acute phase of asthma exacerbation when administered alongside standard pharmacological management.

The improvement in thoracic expansion observed across the axillary, fifth intercostal space, and xiphoid regions indicates enhanced chest wall mobility and respiratory mechanics following intervention. Acute asthma exacerbation is commonly associated with bronchoconstriction, air trapping, and dynamic hyperinflation, which increase respiratory muscle workload and restrict thoracic excursion.[1,2] Under these conditions, patients frequently adopt rapid shallow breathing patterns accompanied by excessive activation of accessory respiratory muscles. Breathing control exercises may help normalize respiratory rhythm and reduce unnecessary upper chest breathing by promoting relaxed diaphragmatic ventilation. Meanwhile, pursed lip breathing prolongs expiratory time and increases expiratory airway pressure, thereby reducing premature airway collapse and facilitating more effective alveolar emptying.[10] The combination of these mechanisms may explain the progressive increase in thoracic expansion demonstrated in this patient, particularly at the fifth intercostal space where the greatest improvement was observed.

The findings of this study are consistent with previous evidence demonstrating beneficial effects of respiratory physiotherapy on ventilatory mechanics in asthma patients. Andreasson et al. reported that breathing exercises administered within specialist asthma care improved symptom control and respiratory efficiency.[4] Similarly, Grznár et al. demonstrated that breathing exercises combined with aerobic training produced improvements in spirometric parameters among patients with bronchial asthma.[13] In the present study, serial thoracic expansion measurements provided additional objective evidence that respiratory physiotherapy may improve chest wall mobility even during the acute exacerbation phase, which remains less frequently explored in existing literature.

Peak expiratory flow also improved progressively from 110 L/min to 140 L/min following intervention. Although the improvement did not approach predicted normal values for adult females, the trend suggests partial improvement in expiratory airflow and reduction in airway obstruction severity. Importantly, the relatively modest increase in peak expiratory flow despite substantial reduction in Borg Dyspnea Scale scores may reflect the complex relationship between subjective dyspnea perception and objective airflow limitation in asthma. Dyspnea perception is influenced not only by airway caliber but also by respiratory muscle workload, breathing pattern efficiency, anxiety, and central respiratory drive. Consequently, patients may experience symptomatic relief despite persistent airflow limitation. This interpretation is supported by previous studies showing that breathing retraining interventions may reduce dyspnea perception and improve breathing efficiency even when spirometric changes remain limited.[6–8]

Another possible explanation for the relatively limited peak expiratory flow improvement is the persistence of residual airway inflammation and bronchial hyperresponsiveness during the acute recovery phase. In acute asthma exacerbation, airway edema and mucus hypersecretion may persist despite short-term symptomatic improvement.[2] Therefore, while respiratory physiotherapy may contribute to improved ventilatory coordination and reduced respiratory effort, normalization of expiratory airflow likely requires longer recovery duration and continued medical treatment. This finding emphasizes that respiratory physiotherapy should be interpreted as a complementary intervention rather than a replacement for pharmacological management in acute asthma care.

Inspiratory capacity measured using the Voldyne incentive spirometer also demonstrated progressive improvement from 700 mL to 1000 mL during intervention**.** Increased inspiratory volume may indicate improved inspiratory muscle recruitment and reduced thoracic restriction. Respiratory muscle dysfunction frequently occurs during acute asthma exacerbation because increased airway resistance elevates inspiratory workload and contributes to respiratory muscle fatigue. Breathing control exercises may reduce respiratory muscle overactivity and improve coordination between inspiratory and expiratory phases, thereby facilitating more efficient ventilation. Furthermore, pursed lip breathing may reduce dynamic hyperinflation and improve inspiratory reserve by enhancing expiratory emptying.[10]

These findings align with previous evidence regarding respiratory muscle training in asthma management. Chung et al. demonstrated that inspiratory muscle training improved respiratory muscle strength in adults with stable asthma after 12 weeks of intervention.[5] Additionally, Lista-Paz et al., in a systematic review and meta-analysis, concluded that respiratory muscle training significantly improved inspiratory muscle performance and pulmonary function parameters in asthma patients.[6] Although the present study involved a shorter intervention duration and an acute clinical setting, the observed improvement in inspiratory capacity supports the physiological rationale that respiratory physiotherapy may contribute to improved ventilatory performance during asthma exacerbation.

The reduction in Borg Dyspnea Scale scores from 7 to 4 represented one of the most clinically relevant findings of this study. Dyspnea is a multidimensional symptom influenced by mechanical, physiological, and psychological factors. During acute exacerbation, increased airway resistance and dynamic hyperinflation elevate respiratory effort and contribute substantially to perceived breathlessness.[2] Breathing control techniques may reduce respiratory rate, decrease respiratory muscle tension, and improve breathing rhythm, thereby lowering the sensation of dyspnea. In addition, pursed lip breathing has been reported to improve ventilatory efficiency and reduce respiratory discomfort by prolonging expiration and minimizing airway collapse.[10]

The substantial reduction in dyspnea observed in this case appears clinically meaningful despite persistent abnormalities in peak expiratory flow values. This finding is important because symptomatic relief and improved breathing comfort often represent primary therapeutic goals during acute exacerbation management. Previous integrative reviews have similarly demonstrated that structured respiratory and physical exercise interventions improve symptom perception, functional tolerance, and respiratory efficiency in asthma patients.[8,9] Moreover, case reports by Syafriningrum and Sumarsono as well as Irianto et al. also demonstrated reductions in dyspnea severity following respiratory physiotherapy interventions in asthma patients.[11,12] The current study expands these findings by documenting serial changes in multiple ventilatory parameters during acute exacerbation management.

The present study also incorporated infrared therapy and upper trapezius muscle release as supportive interventions aimed at reducing accessory respiratory muscle tension. Patients with acute dyspnea frequently demonstrate increased activation of cervical and upper thoracic musculature due to elevated respiratory workload. Muscle tension in the upper trapezius region may contribute to discomfort, inefficient breathing mechanics, and respiratory fatigue. Soft tissue release techniques may therefore facilitate muscle relaxation and improve thoracic mobility. However, evidence supporting infrared therapy specifically in acute asthma exacerbation remains limited. Consequently, the contribution of infrared therapy to the observed outcomes should be interpreted cautiously. The primary clinical improvements observed in this study were more likely associated with breathing control, pursed lip breathing, and concurrent pharmacological treatment.

The potential influence of pharmacological therapy also requires careful consideration when interpreting these findings. The patient received standard medical treatment including bronchodilator and corticosteroid therapy throughout the intervention period. Bronchodilators may rapidly improve airway caliber and reduce airflow limitation, while corticosteroids contribute to suppression of airway inflammation.[2] Therefore, it is not possible to isolate the independent effects of respiratory physiotherapy from concurrent pharmacological management in this single-case study. Nevertheless, the serial improvement in dyspnea perception, thoracic expansion, and inspiratory capacity suggests that respiratory physiotherapy may provide additional supportive benefits beyond pharmacological treatment alone.

From a clinical perspective, these findings support the potential role of respiratory physiotherapy as a complementary intervention during acute asthma exacerbation. Current GINA recommendations emphasize individualized symptom management and optimization of respiratory function during exacerbation episodes.[2] Likewise, ATS/ERS pulmonary rehabilitation principles recognize the importance of breathing strategies and respiratory muscle optimization in chronic respiratory disorders.[15] Although respiratory physiotherapy is more commonly discussed in stable respiratory conditions, the present findings indicate that carefully monitored breathing interventions may also be feasible and beneficial during acute exacerbation when tailored to patient tolerance and clinical stability.

Several limitations should be acknowledged in this study. First, this report involved a single patient; therefore, the findings cannot be generalized to broader asthma populations. Second, the intervention period was relatively short and did not include long-term follow-up evaluation. Third, concurrent pharmacological therapy constituted an important confounding factor that may have contributed substantially to clinical improvement. Fourth, objective pulmonary function testing using spirometry was not available, limiting the comprehensiveness of ventilatory assessment. Finally, because this study used a descriptive case study design without a control condition, causal relationships between intervention and outcomes cannot be established definitively.

Despite these limitations, this study provides clinically relevant insight into the application of multimodal respiratory physiotherapy during acute asthma exacerbation. The use of serial monitoring involving thoracic expansion, peak expiratory flow, inspiratory capacity, and dyspnea assessment represents an important strength because it allows comprehensive evaluation of ventilatory response throughout intervention. Future studies using controlled experimental designs, larger sample sizes, spirometric evaluation, and longer follow-up periods are required to clarify the effectiveness and clinical significance of breathing control and pursed lip breathing in acute asthma management.

Conclusion

This case study demonstrated that the combination of breathing control and pursed lip breathing, integrated with supportive respiratory physiotherapy interventions, was associated with improvements in dyspnea perception, thoracic expansion, inspiratory capacity, and ventilatory function in a patient with acute asthma exacerbation. Serial evaluation showed progressive reduction in Borg Dyspnea Scale scores accompanied by increased thoracic mobility and improved peak expiratory flow during the intervention period.

These findings suggest that respiratory physiotherapy may serve as a useful complementary approach alongside pharmacological management to optimize breathing efficiency and reduce respiratory discomfort during acute exacerbation. Clinically, breathing control and pursed lip breathing may be considered feasible low-risk interventions for improving ventilatory mechanics and patient comfort in acute respiratory care settings when applied under appropriate monitoring.

However, because this study involved a single-case design without long-term follow-up or spirometric evaluation, the findings cannot be generalized broadly. Further studies using controlled experimental designs, larger sample sizes, and comprehensive pulmonary function assessment are necessary to confirm the effectiveness and clinical significance of these interventions in patients with acute asthma exacerbation.

Author Contribution

Fairuz Salsabila Basyasyah: Conceptualization, Methodology, Investigation, Data curation, Formal analysis, Writing original draft.
Isnaini Herawati: Supervision, Validation, Methodology, Writing review and editing.

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Conflict of Interest Statement

The authors declare no conflict of interest.

Funding Sources

This study received no external funding.

Ethics Statement

This study was conducted in accordance with the principles of the Declaration of Helsinki. Written informed consent was obtained from the patient prior to participation and publication of the clinical information. Because this manuscript was prepared as a single-case study based on routine clinical physiotherapy management without experimental intervention, formal ethical clearance was not required according to institutional policy. Nevertheless, patient confidentiality and anonymity were strictly maintained throughout the study.

References

1. Maan J. Effect of inspiratory muscle training and breathing retraining technique on management of asthma: a case study. J Med Pharm Allied Sci. 2025;14(4):8-16.
2. Global Initiative for Asthma. Global strategy for asthma management and prevention: 2025 update. Fontana: Global Initiative for Asthma; 2025.
3. Kementerian Kesehatan Republik Indonesia. Profil kesehatan Indonesia 2023. Jakarta: Kementerian Kesehatan Republik Indonesia; 2024.
4. Andreasson KH, Skou ST, Ulrik CS, Madsen H, Sidenius K, Assing KD, et al. Breathing exercises for patients with asthma in specialist care: a multicenter randomized clinical trial. Ann Am Thorac Soc. 2022;19(9):1498-1506.
5. Chung Y, Huang TY, Liao YH, Kuo YC. 12-week inspiratory muscle training improves respiratory muscle strength in adult patients with stable asthma: a randomized controlled trial. Int J Environ Res Public Health. 2021;18(6):3267.
6. Lista-Paz A, Bouza Cousillas L, Jácome C, Fregonezi G, Labata-Lezaun N, Llurda-Almuzara L, et al. Effect of respiratory muscle training in asthma: a systematic review and meta-analysis. Ann Phys Rehabil Med. 2023;66(3):101691.
7. Kim FS, Rocha JL, Lunardi AC, Bos DSG, Santos EA, Marques da Silva CCB, et al. Effects of combined aerobic and breathing exercises on asthma control: a randomized controlled trial. J Allergy Clin Immunol Pract. 2024;12(12):3328-3336.

8. de Lima FF, Pinheiro DHA, Carvalho CRF. Physical training in adults with asthma: an integrative approach on strategies, mechanisms, and benefits. Front Rehabil Sci. 2023;4:1115352.
9. Liu W, Feng Z, Song S, Lei S. The effectiveness of physical activity in asthma management: an overview of systematic reviews. PLoS One. 2025;20(7):e0325488.
10. Singh R, Choudhry D, Chaudhary D, Kumari A. Comparison of the effect of inspiratory muscle training and incentive spirometer on pulmonary function, respiratory muscle strength, dyspnea and asthma control in asthmatic patients. Int J Res Rev. 2025;12(3):361-370.
11. Syafriningrum IR, Sumarsono NH. Studi kasus: efektivitas terapi latihan Active Cycle of Breathing Technique (ACBT) pada asma bronkial. J Ilm Fisioter. 2023;6(1):17-22.
12. Irianto I, Putri DS, Kamrawati K, Syahar A. Manajemen fisioterapi pada asma: laporan kasus. J Fisioter Rehabil. 2024;8(2):126-132.
13. Grznár L, Sucháň D, Labudová J, Odráška L, Matúš I. Influences of breathing exercises and breathing exercise combined with aerobic exercise on changes in basic spirometry parameters in patients with bronchial asthma. Appl Sci. 2022;12(14):7352.
14. Cleland BT, Ingraham BA, Pitluck MC, Woo D, Ng AV. Reliability and validity of ratings of perceived exertion in persons with multiple sclerosis. Arch Phys Med Rehabil. 2016;97(6):974-982.
15. Spruit MA, Singh SJ, Garvey C, ZuWallack R, Nici L, Rochester C, et al. An official American Thoracic Society/European Respiratory Society statement: key concepts and advances in pulmonary rehabilitation. Am J Respir Crit Care Med. 2013;188(8):e13-e64.