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Clinical Response of Asthma Patients to Blowing Balloon Technique and Diaphragmatic Breathing Exercises: A Case Study in Primary Healthcare Facilities

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ABSTRACT

Background: Asthma remains a prevalent respiratory disorder affecting quality of life globally. In primary care, non-pharmacological therapies such as respiratory exercises are gaining recognition for their clinical benefits. This topic is interesting because it explores simple, low-cost interventions that can improve patient outcomes in community settings. Objective: This study aims to compare the clinical responses of asthma patients to two breathing techniques: balloon-blowing and diaphragmatic breathing. Methods: A descriptive case study was conducted at Puskesmas Lingsar, Lombok Barat, NTB, involving 20 asthma patients equally assigned to two intervention groups. Clinical indicators—respiratory rate, oxygen saturation, sputum presence, dyspnea level, and posture—were observed pre- and post-intervention. Data were analyzed using descriptive statistics. Results: Both groups demonstrated clinical improvement, but the balloon-blowing group showed superior outcomes across most indicators. Notably, they had a lower mean respiratory rate (22 vs. 24 breaths/min), higher oxygen saturation (97.6% vs. 96.4%), and more patients reported reduced dyspnea and improved posture. These results align with existing literature on the effectiveness of expiratory control techniques. Conclusion: The balloon-blowing technique was more effective than diaphragmatic breathing in improving short-term clinical responses among asthma patients in a primary care setting. This finding supports integrating low-cost, evidence-based respiratory exercises into community asthma management.

Keywords: Asthma, Blowing Balloon, Diaphragmatic Breathing, Clinical Response, Non-pharmacological Therapy

INTRODUCTION

Asthma is a chronic inflammatory disorder of the airways that affects over 262 million people worldwide and causes approximately 455,000 deaths annually (World Health Organization, 2021). This condition is characterized by recurrent episodes of wheezing, shortness of breath, chest tightness, and coughing, particularly at night or in the early morning. One of the primary complications experienced by asthma patients is an ineffective breathing pattern, which disrupts gas exchange and contributes to discomfort and anxiety (Global Initiative for Asthma, 2023).

While medications remain the cornerstone of asthma control, there is growing evidence supporting the integration of breathing exercises as a complementary therapy to improve respiratory function and enhance the quality of life (Sedaghati et al., 2023). Among the non-pharmacological methods, the balloon-blowing technique and diaphragmatic breathing exercises have shown promise due to their simplicity, affordability, and capacity to be administered even in resource-limited primary healthcare settings (Astuti & Huriah, 2022).

The balloon-blowing technique involves controlled exhalation against resistance, which can enhance lung elasticity and promote deeper inhalation (M. Ismail & Mathew, 2023). Meanwhile, diaphragmatic breathing emphasizes deep breathing. (Astuti&Huriah, 2022). These methods not only support pulmonary rehabilitation but may also alleviate anxiety and improve patients' sense of control over their breathing (Surya Manurung et al., 2022).

Although breathing techniques are increasingly used for asthma, there is little clinical data comparing their effectiveness, especially in primary health care settings. Existing studies are generally conducted in hospitals or combine multiple interventions, making it difficult to see the specific impact of each technique. Therefore, it is important to examine the response of asthma patients to these two breathing interventions so that their implementation in health centers can be more targeted (Suwaryo et al., 2021).

The aim of this study is to describe and compare the clinical responses of asthma patients with ineffective breathing patterns to balloon blowing and diaphragmatic breathing exercises. We will observe how each technique affects respiratory rate, oxygen saturation (SpO_2), and subjective symptoms such as shortness of breath. With this descriptive approach, this study seeks to identify which technique provides the best clinical outcomes in primary health care (Lusiana et al., 2023).

This topic is highly relevant and interesting because it offers a simple, inexpensive, and non-invasive strategy for asthma management in primary health care, especially in areas with

limited access to specialist care. Furthermore, understanding the differences in the impact of each technique can form the basis for clinical guidelines and nursing interventions that are more tailored to patient needs.

The problem formulation in this study is *How do asthma patients clinically respond to balloon-blowing and diaphragmatic breathing techniques in a primary care setting?* The objective of this research is to explore the effectiveness of each intervention in improving patients' breathing patterns by evaluating clinical indicators such as respiratory rate, SpO_2, and perceived dyspnea following the respective treatments.

LITERATURE REVIEW

Asthma is a chronic respiratory condition marked by inflammation, airway hyperresponsiveness, and intermittent airflow obstruction. These pathophysiological characteristics result in a variety of clinical symptoms, including shortness of breath, wheezing, and chest tightness (Global Initiative for Asthma, 2023) An ineffective breathing pattern, as defined in nursing diagnoses, refers to inspiration and/or expiration that does not provide adequate ventilation and gas exchange. This is often observed in asthma patients during exacerbation or inadequate asthma control (Carpenito, L. J. 2016).

Nursing Interventions and Respiratory Therapy

Nursing interventions for respiratory disorders emphasize both pharmacologic management and non-pharmacologic techniques. Breathing exercises are among the most utilized non-invasive interventions in clinical nursing practice. These concepts are very important in clinical practice (Potter & Perry. 2020), therapeutic breathing exercises can increase lung expansion, improve oxygenation, and decrease the work of breathing, especially in patients with chronic pulmonary diseases.

The blowing balloon technique is based on the principle of resistance breathing. When a patient exhales against the resistance of an inflated balloon, it mimics the mechanism of positive expiratory pressure (PEP), which helps improve airway clearance and lung compliance (Puspitasari et al., 2019) This technique has shown positive effects in pediatric and adult patients by strengthening respiratory muscles and reducing shortness of breath.

Diaphragmatic breathing is a controlled breathing method that emphasizes abdominal movement over thoracic expansion. This technique aims to strengthen the diaphragm, promote relaxation, and decrease the accessory muscle usage commonly seen in shallow, ineffective

breathing (Thomas et al., 201). Clinical trials have demonstrated its benefit in improving pulmonary function and quality of life in patients with asthma and COPD (Yadav et al., 2021).

Multiple studies have explored the effectiveness of breathing techniques in asthma rehabilitation. A study found that respiratory training significantly improved peak expiratory flow and decreased dyspnea severity(Hill et al., 2010). While both blowing balloon and diaphragmatic breathing techniques have been individually studied, there is limited comparative analysis, particularly in primary healthcare settings. This research aims to fill that gap by comparing the two techniques in a real-world context(Elsaid et al., 2023).

The theoretical foundation of this study is also supported by Roy's Adaptation Model, which views patients as biopsychosocial beings adapting to environmental changes. Breathing techniques serve as adaptive mechanisms aimed at restoring physiological homeostasis in patients experiencing respiratory stress(Chen et al., 2024).Based on the previous findings and the conceptual framework, this study was conducted to directly explore how asthma patients respond to two non-pharmacological breathing techniques applied in real-world primary care settings.

METHOD

This study employed a descriptive comparative case study design to explore the clinical responses of asthma patients to two non-pharmacological interventions: the blowing balloon technique and diaphragmatic breathing exercises. This approach allowed for detailed observation and comparison of the interventions within a natural healthcare setting, aiming to assess real-time improvements in patient respiratory function without experimental manipulation. The method was selected to support the objective of evaluating nursing interventions that are simple, cost-effective, and feasible in primary care contexts (BektiPrasetyo&Putri, 2023).

The research was conducted at PuskesmasLingsar, a primary healthcare facility located in West Lombok Regency, Nusa Tenggara Barat (NTB), Indonesia. This location was chosen due to its accessibility to patients with chronic respiratory conditions and its active community health program. The target population consisted of asthma patients currently experiencing symptoms indicative of ineffective breathing patterns.

A purposive sampling method was utilized to recruit twenty patients who fulfilled specific inclusion criteria: they were diagnosed with asthma, in a clinically stable condition, presented with signs of an ineffective breathing pattern, and provided informed consent to participate.

Patients were required to be cooperative and willing to complete the intervention procedures assigned. Exclusion criteria included patients diagnosed with other respiratory illnesses, those who declined participation, or who were noncompliant with the breathing techniques.

Data collection involved structured clinical observation, patient interviews, and physical assessments. Tools such as respiratory rate counters and pulse oximeters were used to measure key variables, including respiratory rate, oxygen saturation (SpO_2), the presence of sputum, and subjective reports of dyspnea(Timmins, 2013) Patients were randomly assigned to receive one of the two breathing interventions, administered for seven days. Each patient was monitored before and after the intervention to record any physiological and clinical changes(Levy et al., 2023).

The analysis employed a descriptive comparative approach. Clinical outcomes from the two intervention groups were compared qualitatively based on observable changes in respiratory indicators (Sugiyono, 2023) These included the improvement in respiratory rate, increased SpO_2 levels, reduced patient-reported breathlessness, and improved posture or absence of respiratory secretions. Rather than applying inferential statistical methods, this study focused on identifying clinical patterns that emerged from real-world patient responses, providing meaningful insights into the relative effectiveness of each technique.

Ethical clearance for this study was obtained from the relevant institutional ethics committee. All participants provided written informed consent, and their anonymity and data confidentiality were fully maintained throughout the research process.

RESULT AND DISCUSSION

The clinical responses of asthma patients to the blowing balloon technique and diaphragmatic breathing exercises were assessed based on five primary indicators: respiratory rate (RR), oxygen saturation (SpO_2), presence of sputum, subjective breathlessness, and posture improvement. The study involved 20 participants, with 10 patients in each intervention group. The following table presents the comparative results.

Table 1. Comparative Clinical Responses of Asthma Patients to Blowing Balloon and Diaphragmatic Breathing Interventions

Clinical Indicator	Blowing Balloon (n = 10)	Diaphragmatic Breathing (n = 10)
Mean RR post-intervention	22 breaths/min	24 breaths/min
Mean SpO_2 post-intervention	97.6%	96.4%
Patients without sputum	9 out of 10	7 out of 10
Patients reporting reduced dyspnea	10 out of 10	8 out of 10
Posture improvement (semi-Fowler)	9 out of 10	7 out of 10

Patients in both groups showed clinical improvement following the respective interventions. The average respiratory rate decreased more significantly in the balloon group (mean RR of 22) compared to the diaphragmatic group (mean RR of 24), indicating better respiratory efficiency.

Oxygen saturation levels improved in both groups, with the balloon group achieving a higher mean SpO_2 (97.6%) than the diaphragmatic group (96.4%). This difference, though modest, suggests more effective alveolar ventilation in the blowing balloon group. Additionally, 90% of patients in the balloon group were free from sputum post-intervention, versus 70% in the diaphragmatic group. Oxygen saturation levels improved in both groups, with the balloon group achieving a higher mean SpO_2 (97.6%) than the diaphragmatic group (96.4%). This difference, though modest, suggests more effective alveolar ventilation in the blowing balloon group. Additionally, 90% of patients in the balloon group were free from sputum post-intervention, versus 70% in the diaphragmatic group. All patients in the balloon group reported reduced dyspnea, consistent with previous. The findings of this study are that the balloon-blowing technique has a more consistent and significant impact on reducing shortness of breath symptoms in asthma patients. All participants who underwent this intervention reported clinical improvement. In contrast, the diaphragmatic breathing technique also showed effectiveness, although with a slightly lower success rate (JISS MARY JAMES & LEANA PHEBE WILSON S, 2023). These results support the effectiveness of both techniques as non-pharmacological interventions capable of reducing symptoms to overcome ineffective breathing patterns, with balloon blowing showing more prominent results in the context of this study (Rajni Thapa Assistant Professor SMVDCoNKatra et al., 2023).

Discussion

These findings confirm that both techniques are beneficial for managing ineffective breathing patterns in asthma patients within primary care settings. The blowing balloon method demonstrated greater overall efficacy. Its success may be attributed to increased intrathoracic pressure and enhanced expiratory airflow, leading to improved pulmonary mechanics and oxygenation (Sumartini et al., 2020).

The diaphragmatic breathing technique remains a valuable intervention, especially for long-term respiratory muscle training, yet its outcomes in this short-term observational setting were slightly inferior to those achieved through the balloon technique (Mahashur et al., 2018) This suggests that while both techniques are appropriate for non-pharmacological respiratory support, the blowing balloon exercise may be more suitable in acute clinical (Bunlam et al., 2024)These results align with nursing goals of promoting airway clearance and improving gas exchange using low-cost, accessible interventions (DWI NINGSIH, 2023). They also reinforce the potential integration of structured respiratory techniques in community-based asthma management programs (Ram et al., 2003).

CONCLUSION

This study involving 20 patients with asthma showed that both the balloon blowing technique and diaphragmatic breathing exercises resulted in clinical improvements across key respiratory indicators. Patients in the balloon-blowing group showed better outcomes, with a lower mean respiratory rate (22 breaths/min vs. 24), higher mean oxygen saturation (97.6% vs. 96.4%), and greater reductions in dyspnea and sputum production. Notably, all patients in the balloon group reported subjective relief from breathlessness, and 90% had improved posture and airway clearance. In comparison, the diaphragm group also showed benefits, albeit slightly less pronounced, with 80% reporting symptom improvement and 70% showing reductions in sputum production. These findings suggest that while both interventions are effective, the balloon blowing technique produces a more consistent and beneficial clinical response in the management of asthma in the primary care setting.

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