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ORIGINAL RESEARCH

The impact of inhaler technique on clinical outcomes in patient with asthma

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ABSTRACT

Background: Proper inhaler technique is crucial for effective asthma management. Incorrect usage may lead to suboptimal drug delivery, increased exacerbations, and poor disease control. This study evaluates the impact of inhaler technique on clinical outcomes in asthma patients. **Materials and Methods:** A total of 200 asthma patients were enrolled in this prospective observational study. Participants were divided into two groups based on their inhaler technique: correct (n=100) and incorrect (n=100). Inhaler technique was assessed using a standardized checklist. Clinical outcomes, including symptom control (measured by the Asthma Control Test, ACT), exacerbation rate, and peak expiratory flow rate (PEFR), were recorded over a six-month follow-up period. Data were analyzed using SPSS software, with a significance level set at $p<0.05$. **Results:** Patients with correct inhaler technique demonstrated significantly better asthma control, with a mean ACT score of 21.3 ± 3.2 compared to 16.7 ± 3.8 in the incorrect technique group ($p<0.001$). The exacerbation rate was lower in the correct technique group (1.2 ± 0.5 per patient per year) than in the incorrect technique group (2.8 ± 0.7, $p<0.01$). Additionally, PEFR values were significantly higher in patients with proper inhaler use (310 ± 45 L/min vs. 265 ± 40 L/min, $p=0.002$). **Conclusion:** Inhaler technique significantly influences asthma control and clinical outcomes. Patients with correct technique exhibit better symptom control, fewer exacerbations, and improved lung function. Educational interventions to enhance inhaler technique should be incorporated into routine asthma management.

Keywords: Asthma, Inhaler technique, Asthma control, Clinical outcomes, Peak expiratory flow rate

INTRODUCTION

Asthma is a chronic respiratory disorder characterized by airway inflammation, bronchial hyperresponsiveness, and reversible airflow obstruction. It affects approximately 300 million individuals globally, contributing to significant morbidity and healthcare costs (1). Effective management of asthma relies on the appropriate use of inhaled medications, which serve as the cornerstone of treatment. However, the effectiveness of inhaler therapy is highly dependent on proper inhaler technique, ensuring optimal drug deposition in the lungs (2).

Studies indicate that a substantial proportion of asthma patients misuse their inhalers, leading to inadequate drug delivery and poor disease control (3,4). Incorrect technique has been associated with increased exacerbations, frequent hospitalizations, and decreased quality of life (5). Factors contributing to improper inhaler use include lack of patient education, poor demonstration techniques by healthcare providers, and cognitive or physical impairments (6).

Several clinical guidelines emphasize the need for inhaler technique training as part of routine asthma care (7). Despite this, incorrect usage remains prevalent, highlighting the necessity for continued patient education and assessment (8). Given the impact of inhaler misuse on clinical outcomes, this study aims to evaluate the relationship between inhaler technique and asthma control, exacerbation rates, and pulmonary function among asthma patients.

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MATERIALS AND METHODS

Study Design and Participants

This prospective observational study was conducted at a tertiary care hospital over a six-month period. A total of 200 asthma patients, aged 18–65 years, were recruited from the outpatient department. Patients with a confirmed diagnosis of asthma, as per the Global Initiative for Asthma (GINA) guidelines, and prescribed inhaler therapy were included in the study. Exclusion criteria involved individuals with chronic obstructive pulmonary disease (COPD), severe cognitive impairments, or those unwilling to participate.

Assessment of Inhaler Technique

Each participant's inhaler technique was evaluated using a standardized checklist based on national and international guidelines. The checklist included key steps such as shaking the inhaler (for pressurized metered-dose inhalers), proper hand-lung coordination, adequate inhalation depth, and breath-holding duration. Patients were categorized into two groups: those demonstrating correct inhaler technique and those with incorrect technique.

Clinical Outcome Measures

Asthma control was assessed using the Asthma Control Test (ACT), a validated questionnaire scoring from 5 (poor control) to 25 (complete control). Patients scoring ≥20 were classified as having well-controlled asthma, while those scoring <20 were considered to have poor control.

Lung function was measured using a Peak Expiratory Flow Rate (PEFR) meter, with results recorded in liters per minute (L/min). Three consecutive readings were taken, and the highest value was used for analysis.

The exacerbation rate was determined by the number of asthma-related emergency visits or hospitalizations reported by patients during the study period.

Educational Intervention and Follow-Up

Patients with incorrect inhaler technique were provided with a brief demonstration on proper usage. Follow-up assessments were conducted at three and six months to evaluate changes in inhaler technique and clinical outcomes.

Statistical Analysis

Data were analyzed using SPSS software (version 25.0). Categorical variables were expressed as percentages, while continuous variables were presented as mean ± standard deviation (SD). A Chi-square test was used to compare categorical data, and an independent t-test was applied for continuous variables. A p-value of <0.05 was considered statistically significant.

RESULTS

Baseline Characteristics of Study Participants

A total of 200 asthma patients participated in the study, with a nearly equal distribution of males (49%) and females (51%). The mean age of the participants was 42.3 ± 12.5 years, and the average duration of asthma was 6.8 ± 4.2 years. Based on inhaler technique assessment, 100 patients (50%) demonstrated correct inhaler usage, while the remaining 100 (50%) had incorrect technique. Detailed baseline characteristics are presented in Table 1.

Table 1: Baseline Characteristics of Study Participants

Characteristics	Mean ± SD / Percentage
Age (years)	42.3 ± 12.5
Male (%)	98 (49%)
Female (%)	102 (51%)
Duration of Asthma (years)	6.8 ± 4.2
Correct Inhaler Technique (%)	100 (50%)
Incorrect Inhaler Technique (%)	100 (50%)

Impact of Inhaler Technique on Clinical Outcomes

Patients with correct inhaler technique showed significantly better asthma control compared to those with incorrect technique. The mean ACT score was 21.3 ± 3.2 in the correct technique group, whereas it was 16.7 ± 3.8 in the incorrect technique group ($p < 0.001$).

Lung function assessment using PEFR revealed higher values in patients with correct inhaler technique (310 ± 45 L/min) compared to those with incorrect technique (265 ± 40 L/min, $p = 0.002$).

Exacerbation rates were notably higher in patients with incorrect inhaler technique, averaging 2.8 ± 0.7 episodes per patient per year, while those with correct technique had a significantly lower rate of 1.2 ± 0.5 episodes per year ($p < 0.01$). These findings highlight the importance of proper inhaler usage in achieving better asthma control (Table 2).

Table 2: Comparison of Clinical Outcomes between Correct and Incorrect Inhaler Technique Groups

Clinical Outcomes	Correct Technique (Mean ± SD)	Incorrect Technique (Mean ± SD)	p-value
ACT Score	21.3 ± 3.2	16.7 ± 3.8	<0.001
PEFR (L/min)	310 ± 45	265 ± 40	0.002

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Exacerbation Rate (per patient/year)	**1.2 ± 0.5**	**2.8 ± 0.7**	**<0.01**

DISCUSSION

The findings of this study emphasize the significant impact of inhaler technique on asthma control, lung function, and exacerbation rates. Patients who demonstrated correct inhaler technique had significantly better clinical outcomes, reinforcing the importance of proper inhalation practices in asthma management.

Several studies have reported that improper inhaler technique is a common issue among asthma patients, with error rates ranging from 30% to 80% (1,2). Poor technique leads to inadequate drug deposition in the lungs, contributing to uncontrolled symptoms and increased exacerbations (3,4). In this study, patients with incorrect inhaler use had significantly lower Asthma Control Test (ACT) scores, consistent with previous research that links improper inhalation to poor symptom management (5,6).

Inhaler technique errors have also been associated with reduced lung function. Our results showed that the peak expiratory flow rate (PEFR) was significantly higher in patients using their inhalers correctly. This finding aligns with previous studies indicating that optimal drug delivery improves airflow parameters and reduces airway inflammation (7,8). Patients with incorrect technique had significantly lower PEFR values, suggesting that they were receiving suboptimal bronchodilation due to inefficient medication administration (9).

The exacerbation rate in the incorrect inhaler technique group was significantly higher, mirroring the results of prior studies that highlight an increased risk of hospitalizations and emergency visits among patients with inhaler misuse (10,11). The potential reasons for this include insufficient medication reaching the lower airways, leading to persistent inflammation and worsening symptoms (12). Educating patients on proper inhaler usage has been shown to reduce exacerbation frequency and improve disease stability (13).

One of the key implications of this study is the necessity of regular inhaler technique assessment and patient education. Studies suggest that repeated demonstration and training sessions significantly enhance inhaler technique and improve treatment outcomes (14,15). Therefore, incorporating inhaler training into routine asthma care may help reduce the burden of poorly controlled asthma and its associated complications.

Limitations

Despite the strengths of this study, some limitations should be acknowledged. The study was conducted in a single-center setting, which may limit the generalizability of the findings. Additionally, self-reported adherence to inhaler use was not assessed, which could have influenced the results. Future multicenter studies with larger sample sizes and adherence monitoring are recommended to further validate these findings.

CONCLUSION

We can conclude from this study that inhaler technique significantly influences asthma control and clinical outcomes. Patients with correct technique exhibit better symptom control, fewer exacerbations, and improved lung function. Educational interventions to enhance inhaler technique should be incorporated into routine asthma management.

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