



PREVALENCE OF POOR INHALER TECHNIQUE AND ITS DETERMINANTS AMONG PATIENTS WITH ASTHMA AND COPD: A CROSS-SECTIONAL STUDY

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ABSTRACT

Background: Inhaler therapy is the cornerstone of management in asthma and COPD. Poor inhaler technique remains a major cause of suboptimal disease control, increased exacerbations, and healthcare costs. Data on the prevalence and determinants of poor technique in Indian settings are limited. **Objective:** To determine the prevalence of poor inhaler technique and identify its associated factors among patients with asthma and COPD attending a tertiary care pulmonary clinic. **Methods:** A hospital-based cross-sectional study was conducted over six months. A total of 200 consecutive patients (100 asthma, 100 COPD) using inhalers for ≥ 3 months were enrolled. Inhaler technique was assessed using standardized checklists for metered-dose inhalers (MDI) and dry-powder inhalers (DPI). Technique was categorized as good ($\geq 80\%$ steps correct), fair (50–79%), or poor ($< 50\%$). Demographic, clinical, and educational data were collected. Statistical analysis included chi-square tests and logistic regression. **Results:** Poor inhaler technique was observed in 48.5% ($n=97$) of patients. The prevalence was higher in COPD patients (56%) than in asthma patients (41%). Significant predictors of poor technique were older age (> 60 years), lower education level, use of MDI, and lack of previous demonstration by healthcare professionals (all $p < 0.01$). Patients with poor technique had significantly higher rates of uncontrolled disease ($p < 0.001$). **Conclusion:** Nearly half of patients with asthma and COPD demonstrate poor inhaler technique. Targeted education and repeated demonstration by healthcare providers are essential to improve technique and disease outcomes.

KEYWORDS : Inhaler Technique, Asthma, COPD, MDI, DPI, Adherence, Disease Control

1. INTRODUCTION

Asthma and chronic obstructive pulmonary disease (COPD) are leading causes of morbidity and mortality worldwide, affecting over 500 million people globally (1,2). Inhaled medications remain the mainstay of therapy for both conditions; however, their clinical effectiveness depends critically on correct inhaler technique. Multiple international studies have consistently reported that 50–80% of patients use inhalers incorrectly, resulting in poor symptom control, increased frequency of exacerbations, unnecessary escalation of therapy, higher healthcare costs, and reduced quality of life (3,4).

In low- and middle-income countries such as India, where the combined burden of asthma and COPD is substantial, the problem is further compounded by limited patient education, lack of standardized inhaler training protocols, and high out-of-pocket expenditure on medications. Previous Indian studies have shown wide variation in the prevalence of correct inhaler use, ranging from 20% to 55%, highlighting the need for region-specific data (5,6). Factors known to influence inhaler technique include age, educational status, type of device (metered-dose inhaler vs dry-powder inhaler), duration of disease, and whether patients have ever received a practical demonstration by a healthcare professional (7,8).

Despite the well-established importance of correct inhaler technique, routine assessment and retraining are not consistently performed in many Indian pulmonary clinics. Identifying the prevalence and modifiable determinants of poor technique is therefore essential for designing targeted educational interventions that can improve disease outcomes and reduce the overall burden on the healthcare system.

This study was conducted to determine the prevalence of poor inhaler technique and to identify its key determinants among patients with asthma and COPD attending a tertiary care pulmonary medicine outpatient department.

2. METHODOLOGY

2.1 Study Design and Setting

A hospital-based, observational cross-sectional study was conducted over a period of six months (January 2025 – June 2025) at the Department of Respiratory Medicine, KM Medical College, Mathura. Institutional Ethics Committee approval was obtained and written informed consent was obtained from all participants prior to enrolment.

2.2 Sample Size and Sampling

A sample size of 200 patients was calculated using the formula for cross-sectional studies, assuming an expected prevalence of poor inhaler technique of 50% (based on previous literature), 95% confidence level, and 7% absolute precision. Consecutive sampling was used to recruit eligible patients attending the outpatient clinic during the study period.

2.3 Participants

Inclusion criteria were adults aged ≥ 18 years with a physician-confirmed diagnosis of asthma or COPD (post-bronchodilator FEV1/FVC < 0.70 for COPD) who had been using either a metered-dose inhaler (MDI) or dry-powder inhaler (DPI) for at least three months. Patients with cognitive impairment, acute exacerbation within the preceding four weeks, inability to perform spirometry or inhaler technique assessment, or those who declined consent were excluded.

2.4 Data Collection Tools

A structured proforma was used to record demographic details (age, sex, education level), clinical characteristics (diagnosis, duration of disease, smoking history, comorbidities), type of inhaler device, and history of prior inhaler technique demonstration by any healthcare provider. Disease control was assessed using the Asthma Control Test (ACT) for asthma patients and the COPD Assessment Test (CAT) for COPD patients.

Inhaler technique was evaluated by a single trained respiratory therapist using validated, device-specific checklists containing 10–12 steps. Each step was scored as correct or incorrect. Overall technique was classified as good ($\geq 80\%$ steps correct), fair (50–79% correct), or poor ($< 50\%$ correct).

2.5 Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS version 25.0. Descriptive statistics (mean $\pm$ SD, frequencies, percentages) were used to summarize the data. Chi-square test or Fisher's exact test was applied for categorical variables, and independent t-test or Mann-Whitney U test for continuous variables. Multivariate logistic regression was performed to identify independent predictors of poor inhaler technique. A p-value < 0.05 was considered statistically significant.

3. RESULTS

3.1 Demographic and Clinical Profile

A total of 200 patients were enrolled (100 asthma, 100 COPD). The mean age was 52.4 ± 14.8 years; 62% were male. The majority (58%) were using MDIs, while 42% were using DPIs. Only 38% of patients reported having received a prior practical demonstration of correct inhaler technique by a doctor, nurse, or pharmacist.

3.2 Prevalence of Inhaler Technique

Overall, poor inhaler technique was observed in 48.5% ($n=97$) of patients, fair technique in 31.5% ($n=63$), and good technique in only 20% ($n=40$). The prevalence of poor technique was significantly higher among COPD patients (56%) compared with asthma patients (41%) ($p=0.03$).

3.3 Determinants of Poor Inhaler Technique

Table 1 shows the significant associations between patient characteristics and poor inhaler technique.

Table 1: Factors Associated with Poor Inhaler Technique

Variable	Poor Technique n (%)	p-value
Age >60 years	45 (68.2)	<0.001
Education $\leq$ primary school	50 (71.4)	<0.001
MDI use	69 (59.5)	0.002
No prior technique demonstration	89 (72.8)	<0.001
COPD diagnosis	56 (56.0)	0.03
Duration of disease >5 years	62 (55.9)	0.01

On multivariate logistic regression analysis, independent predictors of poor technique were age >60 years (OR 2.8, 95% CI 1.6–4.9, $p<0.001$), absence of prior demonstration (OR 4.1, 95% CI 2.3–7.3, $p<0.001$), and MDI use (OR 2.1, 95% CI 1.2–3.7, $p=0.01$).

3.4 Association with Disease Control

Patients with poor inhaler technique had significantly higher rates of uncontrolled disease (ACT score <20 or CAT score ≥ 10) compared with those having good technique (68% vs 22%, $p<0.001$). Mean ACT score was 15.2 ± 4.8 in the poor-technique group versus 21.4 ± 3.9 in the good-technique group ($p<0.001$). Similarly, mean CAT score was 18.7 ± 6.2 versus 11.3 ± 5.1 ($p<0.001$).

4. DISCUSSION

The present study found that nearly half (48.5%) of patients with asthma and COPD attending a tertiary care pulmonary clinic demonstrated poor inhaler technique. This finding is consistent with global literature reporting incorrect inhaler use in 40–80% of patients (3,4,9). The higher prevalence among COPD patients (56%) compared with asthma patients (41%) may be attributed to older age, greater disease severity, and more complex treatment regimens commonly seen in COPD (10).

Several modifiable and non-modifiable factors were identified as significant predictors of poor technique. Lack of prior practical demonstration emerged as the strongest independent predictor (OR 4.1), reinforcing the importance of hands-on training rather than verbal instructions alone (7,11). MDI users had significantly poorer technique than DPI users, likely due to the coordination required between actuation and inhalation, a well-documented challenge in the literature (12). Older age and lower educational status were also strongly associated with poor technique, highlighting the need for simplified, repeated, and culturally appropriate education sessions tailored to vulnerable populations (6,8).

The strong association between poor inhaler technique and uncontrolled disease (68% vs 22%) underscores the direct clinical impact of correct device use on symptom control and

exacerbation risk. Similar findings have been reported in previous Indian and international studies (5,13). These results emphasize that inhaler technique assessment should be an integral part of every clinical visit, especially for patients with frequent exacerbations or poor disease control.

Limitations of the study include its single-center design, cross-sectional nature (precluding causal inference), and reliance on observed technique in a clinical setting rather than real-world daily use at home. Future multicenter longitudinal studies with objective measures such as electronic monitoring devices and assessment of the impact of repeated training interventions on long-term outcomes are warranted.

5. CONCLUSION

Poor inhaler technique is highly prevalent (48.5%) among patients with asthma and COPD and is significantly associated with older age, lower education, MDI use, and lack of prior training by healthcare professionals. Routine assessment and repeated practical demonstration of correct inhaler technique should be incorporated into standard clinical practice to improve disease control, reduce exacerbations, and enhance patient quality of life.

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