

ASSESSMENT OF INHALATION PRACTICES FOR PATIENTS WITH ASTHMA

Dr. D. Rathnasree¹, Chinthakuntla Nikhitha², Ajhar Uddin³, Meesala Mahender Reddy⁴

¹ Corresponding author: Dr.D. Rathasree, Associate Professor,

^{2,3,4} Coauthors: Phar.D., 2nd year (PB),

^{1,2,3,4} Samskruti College of Pharmacy, Kondapur(v), Ghatkesar(m), Medchal Dist, Hyderabad-501301, Telangana.

ABSTRACT: Background: Asthma is a chronic respiratory disorder marked by airway inflammation and constriction, which manifests as coughing, wheezing, and dyspnea. A considerable proportion of the patient population seeking medical attention comprises individuals diagnosed with asthma, and exacerbations of the condition frequently result in hospital admissions. One of the predominant contributors to suboptimal asthma management is incorrect inhaler technique. Proper inhaler usage enhances drug delivery efficiency, potentially lowering the required dosage and minimizing associated adverse effects. Various inhalation devices are utilized in asthma management, including pressurized metered-dose inhalers (pMDIs), dry powder inhalers (DPIs), and nebulizers. This study focuses on evaluating the correctness of inhaler techniques among asthma patients and emphasizes the need for proper device handling. Objectives: The principal aim of this study was to identify common inhaler usage errors, assess the accuracy of inhalation techniques among asthmatic patients, and evaluate the safety and therapeutic effectiveness of inhaler-based treatment. Methodology: This prospective observational study was conducted on a sample of approximately 150 adult asthma outpatients aged between 18 and 90 years, selected according to predetermined inclusion criteria. The study's primary goal was to detect inhalation technique errors. Given that correct inhaler usage is vital for optimal medication delivery, the complexity of various devices often results in misuse. A standardized checklist was employed to assess the accuracy of inhaler usage. Results: The study revealed that the most frequently used inhaler type was the DPI (46.6%), followed by pMDI (40%) and nebulizers (30%). A notable observation was the high rate of technique errors among patients with lower literacy levels and those with only primary education. The combination therapy of formoterol and budesonide was the most commonly prescribed medication, with a standard dosage of 200 mcg administered via MDI and DPI, and 0.5 mg via nebulizer. Reported adverse effects were minimal, affirming the safety profile of inhaler-based therapies. Conclusion: The findings indicate that a majority of participants demonstrated incorrect inhaler techniques, often committing multiple errors. Repetitive training and practical demonstrations are essential to improve patient competence in using inhalers. Despite the high error rates, the treatment was generally safe, underscoring the need to enhance patient education regarding proper inhaler use.

Keywords: Asthma, Inhaler devices, Inhalation techniques, pMDI, DPI, Nebulizer, Technique errors, Safety, Patient education, Demonstration.

INTRODUCTION

Asthma is a chronic, long-term respiratory disorder characterized by persistent inflammation and narrowing of the airways in the lungs. This narrowing is primarily caused by inflammatory responses and the contraction of the smooth muscles surrounding the bronchi, which impairs normal airflow

and results in symptoms such as wheezing, coughing, chest tightness, and shortness of breath. Globally, asthma affects an estimated 334 million individuals, and it contributes to approximately 250,000 deaths annually. The global burden of asthma is steadily increasing, with projections indicating an expected rise of 100 million new cases by the year 2025. This

increasing prevalence makes asthma a significant public health concern worldwide. Asthma affects individuals of all age groups, though its occurrence shows variation based on age and gender. In the pediatric population, asthma is more commonly diagnosed in boys than girls. However, in adulthood, the trend reverses, with a higher incidence observed in women compared to men. These patterns suggest the involvement of hormonal, genetic, and environmental factors in disease manifestation.

Methodology:

Study Design: This study is structured as a prospective observational investigation, aimed at assessing inhalation practices among asthma patients. The study will span a period of six months, during which patient data will be systematically collected and analyzed to examine inhaler usage patterns and their correlation with asthma severity.

Study site: The research will be conducted in the Department of Pulmonology at Kamineni Hospitals, LB Nagar Hyderabad Telangana, India, a tertiary care facility known for managing respiratory disorders.

Study Duration: The total duration of the study is six months, during which eligible participants will be recruited, and relevant data will be documented and evaluated.

Study Population: The target population consists of adult patients diagnosed with asthma and presenting with one or more comorbid conditions. Only outpatients visiting the Pulmonology Department will be considered. An estimated sample size of 100 to 150 patients is anticipated.

Inclusion criteria:

Male and female patients aged between 18 and 90 years. Individuals diagnosed with asthma who also present with comorbidities.

Patients attending the outpatient department (OPD).

Exclusion criteria:

Pediatric patients (below 18 years of age).

Pregnant and lactating women.

Patients who are unconscious or unable to participate.

Inpatients admitted to the hospital.

Research methodology:

Research Design

This study employed a cross-sectional observational design to assess the inhalation practices among asthma patients. The goal

was to evaluate the correctness of inhaler usage and identify any common errors or misconceptions in technique.

Study setting

The study was conducted in the outpatient departments of selected tertiary care hospitals and community clinics that treat asthma patients.

Study Population

The study population consisted of asthma patients who were prescribed and regularly using inhalers (MDI, DPI, or other forms) as part of their treatment regimen.

Data Collection Tools and Procedure

A structured observational checklist based on standard inhaler technique guidelines (e.g., GINA, WHO) was used to evaluate patient practices. Additionally, a semi-structured questionnaire captured demographic details, duration of inhaler use, and prior education on inhaler use. Each patient was asked to demonstrate their inhalation technique using their prescribed device. The demonstration was observed and scored based on pre-defined critical steps (e.g., shaking the inhaler, exhalation before inhalation, breath-holding after inhalation, etc.).

Data Analysis

Collected data were coded and analyzed using Microsoft Excel and SPSS software (version XX). Descriptive statistics such as percentages, means, and standard deviations were used. Inferential statistics like chi-square tests were used to assess associations between demographic factors and correct inhaler technique.

Ethical Considerations

Ethical approval was obtained from the Institutional Ethics Committee. Participation was voluntary, and patient confidentiality was strictly maintained.

Data Analysis Techniques

The data collected from the structured checklist and questionnaire were analyzed using the following statistical techniques:

Descriptive Statistics

Frequencies and Percentages were used to summarize categorical variables such as gender, type of inhaler used, prior education on inhaler use, and presence of errors in technique.

Means and Standard Deviations were calculated for continuous variables such as age and duration of inhaler use.

Scoring System

Each step of the inhaler technique was assigned a score (1 for correct, 0 for incorrect).

A total score was calculated for each patient.

Scores were categorized as:

Good Technique: $\geq 80\%$ of steps correct

Moderate Technique: 50–79% correct

Poor Technique: $< 50\%$ correct

Inferential Statistics

Chi-square test was used to determine the association between correct inhaler technique and variables such as:

Gender

Education level

Duration of inhaler use

Type of inhaler

Prior training on inhaler technique

A p-value < 0.05 was considered statistically significant.

Software Used

Data entry and management were done using Microsoft Excel.

Statistical analysis was carried out using IBM SPSS Statistics (Version XX).

Results: Gender-based distribution among the research population

Table 1: Gender Wise Distribution

Gender	Number of Participants	Percentage (%)
Male	80	53.3%
Female	70	46.7%
Total	150	100%

Table 2: Sample distribution of populations according to age criteria

Age	Male	Female	Total
18-30	8	12	20
31-50	10	40	50
>50	25	55	80

The age-wise distribution of the population under the study showed that 20 individuals were in the 18–30 age group, 50 individuals were in the 31–50 age group, and 80 individuals were above 50 years of age. The results reveal that the asthmatic population comprised a larger proportion of individuals aged above 50.

Table 3: Age – wise distribution of population

Age Group (Years)	Number of Participants	Percentage (%)
18–30	20	13.3%
31–50	50	33.3%
Above 50	80	53.3%
Total	150	100%

Table 4: Population distribution for the research according to family history of asthma

Family History of Asthma	Number of Participants	Percentage (%)
Yes	48	32%
No	102	68%
Total	150	100%

Table 5: Study population distribution according to allergies

Distribution Based on Allergy		
Allergy	N	%
Dust	70	46.6%
Cold Environment	20	13.4%
Cold Items	25	16.6%
Pollen	5	3.4%
Macrolides	2	1.3%
Dust Cold Environment Cold items	16	10.7%
Dust Cold Environment	12	8%

Table 6: Study population distribution according to medications that are frequently prescribed for individuals with asthma

Drugs	N	%
Formoterol + Budesonide	110	73.3%
Vilanterol + Fluticasone Propionate	20	13.30%
Salmeterol + Fluticasone Propionate	10	6.60%
Formoterol + Fluticasone Propionate	8	5%
Le Vo salbutamol + Ipratropium	7	5%
Others	15	10.00%

Discussion:

Chronic asthma is a prevalent respiratory condition characterized by the inflammation and narrowing of the

airways, leading to symptoms such as coughing, wheezing, and shortness of breath. Inhalation therapy is a cornerstone of asthma management, providing targeted drug delivery to the lungs. However, despite its importance, proper inhaler technique remains a challenge for many patients. Errors in inhaler use are common, which can significantly affect the effectiveness of the treatment. The study explored various inhalation devices commonly prescribed to asthma patients. We found that the majority of patients used dry powder inhalers (DPIs) (46.6%), followed by pressurized metered-dose inhalers (pMDIs) (40%) and nebulizers (30%). A smaller percentage of patients used a combination of devices, such as DPI + nebulizer (10%), pMDI + spacer (4%), and pMDI + DPI (3.3%). This variation in device usage is indicative of the diverse approaches taken in asthma management, with the choice of device often dependent on patient preference, the severity of asthma, and the healthcare provider's recommendation. The most common inhalation error observed across devices was the failure to hold the breath for 5-10 seconds after inhalation, which is a critical step for maximizing drug deposition in the lungs. This error was seen in both pMDIs and DPIs, where the highest error rate occurred at this step. Nebulizer users, on the other hand, failed to cough after completing nebulization, another important step to clear the airways. These device-specific errors underscore the need for targeted education and training on correct inhaler usage.

Key Findings:

Inhaler Technique Knowledge: A significant number of patients demonstrated inadequate knowledge about the correct use of inhalers. This was evidenced by a high percentage of patients incorrectly using their inhalers, which is consistent with previous research indicating a global issue with inhaler technique, particularly in low-and middle-income countries.

Adherence to Instructions: There was a notable discrepancy between patients' self-reported adherence to prescribed inhalation practices and their actual technique. Although most patients claimed to follow instructions closely, the assessment showed that a significant portion did not perform the correct steps.

Age and Education Level: Age and education level emerged as crucial factors influencing inhalation technique. Younger patients and those with lower education levels were more likely

to make errors in inhalation technique, aligning with prior studies that suggest that better education and tailored instruction may improve asthma management.

Healthcare Provider Interaction: Interaction with healthcare providers also played a key role in correct inhalation practices. Patients who had received formal training from healthcare professionals exhibited better technique, highlighting the importance of regular follow-ups and demonstrations of proper inhalation methods.

Device Type: There were variations in technique depending on the inhaler device used. Metered-dose inhalers (MDIs) were more likely to be misused compared to dry powder inhalers (DPIs), a trend observed in other studies. This suggests that MDIs require more detailed instruction on the correct usage steps.

CONCLUSION:

This study underscores a significant concern regarding the proper use of inhalers among asthma patients. With 94% of the 150 participants demonstrating incorrect inhalation techniques, and 77% making multiple errors, the results highlight the widespread nature of inhalation issues. These findings call for urgent improvements in patient education and the development of effective intervention strategies to optimize inhaler therapy.

The error rates varied across different inhaler types, with 40% of the 50 participants using pressurized metered-dose inhalers (pMDIs), 46.6% of the 60 participants using dry powder inhalers (DPIs), and 30% of the 70 participants using nebulizers making errors. These figures align with previous research, confirming that inhaler technique errors are a common challenge across various devices. The variation in error rates underscores the need for device-specific education and guidance. A key observation from this study was the higher error rates among patients with limited formal education, particularly those with no education or only primary schooling. This group made the most errors, emphasizing the need for tailored, more comprehensive educational interventions. Strategies such as hands-on demonstrations, repeated instructions, and visual aids could be pivotal in improving inhaler technique among these patients. For those with lower education levels, interactive and personalized teaching methods are essential to reinforce correct inhaler use. The use of a standardized checklist for each inhaler type proved to be a

strength of this study, enabling precise identification of common errors at each step of the inhalation process. This systematic approach offers a valuable tool for healthcare providers, helping to address inhalation errors during patient visits effectively. While inhaler therapy remains an effective and safe treatment for asthma, even small errors in technique can lead to suboptimal medication delivery, reduced asthma control, and an increased risk of exacerbations. Fortunately, the study observed minimal side effects associated with inhaler use, confirming that inhalers are generally safe when used correctly.

LIMITATIONS

This prospective observational study on inhaler therapy among asthma patients is subject to several limitations that should be taken into account when interpreting the findings: Limited Generalizability: The results of this study may not be easily generalized to the larger asthma patient population due to the relatively small and specific sample size. The sample may not reflect the diverse range of asthma patients in terms of demographic characteristics, comorbidities, or disease severity, which limits the broader applicability of the conclusions. Observer Bias: The evaluation of inhalation techniques in this study was dependent on the observations of healthcare professionals, introducing the possibility of observer bias. Differences in the interpretation of proper inhaler technique across observers could result in inconsistencies, affecting the overall reliability of the findings. Recall Bias: The study required participants to recall and report their inhaler usage, which introduces the potential for recall bias. Inaccuracies in memory, such as forgetting or misrepresenting inhaler use, could undermine the reliability of the data and affect the validity of the conclusions drawn from it.

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