

## Original Research Article

# An evaluation of proper inhaler technique and adherence to treatment in asthma patients

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### ABSTRACT

**Background:** Medications used to manage Asthma is delivered via inhaler devices. Proper usage of these devices are required for effective medication delivery. Aim of this study is assess the degree of proper inhaler technique and adherence to treatment among adult asthma patients.

**Methods:** Patients using inhalers were identified and interviewed regarding inhaler use. Checklists were used to document the adherence to manufacturers' directions for each respective inhaler, and data were then tabulated and assessed for the types of inhalers used, incorrectly performed steps in using the inhalers, as well as demographic information of patients.

**Results:** Out of 120 patients that taken as subjects, twenty-four percent of inhalers (29/120) used incorrectly, with the most common errors being improper priming, lack of proper exhalation prior to inhaling the medication, and absence of rinsing mouth following the use of inhaled corticosteroid. Furthermore, only 60% of the patients are adherent to asthma medications.

**Conclusions:** Inhaler technique among adult patients is substandard and is considered a key area for physicians to more proactive in educating patients. For obtaining most accurate therapeutic advantage among patients with inhalers, proper instruction and demonstration regarding inhaler use need to be given to all patients, particularly elderly patients.

**Keywords:** Asthma, Adherence, Compliance, Inhaler, Therapy

### INTRODUCTION

Asthma, a chronic inflammatory disease of the airway, is characterized by recurrent bouts of shortness of breath, chest tightness, wheezing and coughing in response to stimuli such as allergens, occupational irritants, drugs, and stress. About 300 million people are affected with this disease worldwide, and there is increase in prevalence for every 10 years.<sup>1</sup> Majority of medications in asthma are administered through inhaler devices. Optimal drug delivery methods become critical in the

management of asthma. As per the Global Initiative for Asthma (GINA) guidelines, the ability to deliver drugs directly to airways is a therapeutic advantage.<sup>2</sup> The correct technique and proper use of inhaler ensures effective delivery of drugs to lungs and thus affects the disease control. Guidelines stress on inhaler technique and adherence to the extent that every recommendation about treatment adjustment includes a reminder to check inhaler technique and adherence at the outset.<sup>3</sup> Against this backdrop, this study was planned to assess the

adherence to the medications and the inhaler technique in patients with asthma.

Most of the patients with asthma can have complete control over the symptoms and can pursue regular activities without any restrictions. However, prospective studies from real-life scenarios have confirmed that a significant number of patients do not achieve this target.<sup>4-6</sup> It is often noted that a significant number of patients suffer from poorly controlled asthma despite being on the appropriate medication and upward titration of the treatment, as recommended by Asthma guidelines. Few of the factors associated with poor asthma control are inadequate access to health-care, smoking, poor compliance, faulty inhaler use, a lack of specialist care and low literacy area.<sup>7-9</sup> Many patients with difficult asthma have improper inhaler techniques and are poorly adherent to inhaled corticosteroid therapy.<sup>10-12</sup> Studies indicates that improving compliance and inhaler technique results in better asthma outcomes, including improved control and quality of life.<sup>9,13,14</sup>

The aims of this study were to evaluate the degree of proper inhaler technique and adherence to treatment among adult asthma patients.

## METHODS

This cross-sectional study was conducted at the Department Pulmonary medicine, Sree Gokulam Medical College and Research Foundation, a territory care teaching hospital, during the period of August, 2016 to December, 2016 (6 months).

All the adult patients of either gender diagnosed to have asthma who were prescribed inhalation agents, attended in Pulmonary Medicine outpatient department was included in the study. Pregnant females, children and those who started using inhaler very recently (i.e., within 1 week) were excluded from the study.

Proper inhaler using technique was assessed by asking patients to demonstrate the way how inhalers use. Individualized checklists for each type of inhaler based on the manufacturers' directions or prescribing information were used to assess proper inhaler technique. The specific methods of cleaning each type of inhaler was also based on manufacturers' recommendations and whether patients cleaned their spacer was asked as just a general question without regard to technique. The use of spacers was only a consideration for those of which it was applicable (i.e. metered dose inhalers).

Based on the checklists, patients were determined to have followed all directions recommended for optimum benefit from the inhalers or whether they missed or incorrectly performed any steps. If incorrect technique was observed, interviewers explained the corrections and ensured proper use before closing the session by asking the patients to explain the corrections and demonstrate how they would

now administer their medications. Demographic information such as gender, ethnicity, age, and place of residence was also gathered. Type of respiratory condition, duration of condition, and duration of inhaler use were also included as additional data. Patients were also asked to identify health care personnel that provided initial or prior instruction on how to use their inhaler(s) (i.e., pharmacist, physician, nurse, respiratory therapist, self-taught, etc) and to self-report inhaler adherence, as either missing no scheduled doses or missing some doses.

The data like demographic details, details of the drug treatment, details regarding learning of inhalation technique of inhalers were recorded in the pre-validated case record form (CRF) after taking personal interview. The patients were requested to carry out demonstration on how they use the inhaler so that the steps could be assessed and compared with the checklist about the inhalation technique by the investigator. Recorded information of patients was entered using Microsoft Excel Worksheet and analyzed.

## RESULTS

Overall, 120 adults interviewed and assessed regarding inhaler use, the mean age of the patients was 44 years with female predominance (Table 1). Majority of the patients achieved primary education (26%) followed by higher secondary education (24%), secondary education (20%), graduation (18%) and illiteracy (12%). Majority of the patients were laborers (32.1%) followed by housewives (25.4%).

**Table: 1 Demographic details.**

Category	n	%
<b>Gender</b>		
Men	52	43.33
Women	68	56.66
<b>Age</b>		
Mean	44 years	
Range	15-68 years	

**Table 2: Years with asthma.**

Mean - 12.1years	n	%
<1 year	20	16.66
1-10 years	38	31.66
10-20 years	46	38.33
>20 years	16	13.33

Asthma was diagnosed more than 10 years in majority of patients, with mean of 12.1 years (Table 2). Most of the patients started using inhaler between 1-5 years with mean 6 years (Table 3).

Of the 120 inhalers that were assessed for proper technique, 91 (75.8%) of them were used correctly by patients. Only 60 out of 120 patients (50%) used MDI

(with or without spacer) (Table 4). Patients having secondary education followed the essential steps significantly less compared to graduates ( $p < 0.01$ ). Otherwise there was no significant difference between the education groups. There was also no significant difference between male and female for following the essential steps. Improper timing of actuation and inhalation seen in 11 patients and improper position of inhaler in mouth seen in 4 patients using MDI. Improper inhaler technique is less in patients using dry powder inhalers (DPI) (10/52) and Diskus (2/8). 89% of patients breath out before inhalation properly done and 86% breath hold following inhalation. 80% of patient follow

instruction regarding rinse mouth after use of inhaled corticosteroid.

**Table 3: Years of inhaler use.**

Mean-6years	n	%
New	15	12.5
<1 year	30	25
1-5 years	43	35.83
6-10 years	25	20.83
>10 years	7	5.83

**Table 4: Summary of inhalers used improperly.**

Inhaler	Total number used by patients	Frequency of improper inhaler use	Breathe out before inhalation	Shake inhaler prior to use	Improper timing of actuation and inhalation	Hold breath following inhalation	Improper position of inhaler in mouth	Rinse mouth following use of inhaled corticosteroid
MDI	29	11	26	20	11	26	2	21
MDI +spacer	31	6	27	24		27	1	27
DPI	52	10	47			44		42
Diskus	8	2	7			7	1	6
n	120	29	107	44	11	104	4	96
%	100%	24.16	89.16	73.33		86.66	3.33	80

**Table 5: Patient responses to questions regarding inhaler use.**

Question	Response	n	(%)
Who taught patient how to use the inhaler	Pharmacist	12	10
	Physician	46	38.33
	Nurse	30	25
	Self-taught	32	26.66
Patient reported adherence with inhaler	Yes-always adherent	73	60.83
	No-sometimes missed doses	47	39.16
Uses a spacer (n = 60 applicable inhalers)	Yes	31	51.66
	No	29	48.33
Cleans spacer regularly as directed (n = 29 applicable patients)	Yes	23	79.31
	No	6	20.68
Routinely checks or is aware of expiration date of inhalers	Yes	70	58.33
	No	50	41.66

Physicians were taught and trained inhaler technique in most of the patients. Only 51% of patient using spacer along with MDI. Out of 29 patient using spacer, 79% clean spacer regularly as directed. Only 58% of patients routinely checks or aware of expire date of inhalers. 60% of patients reported adherence asthma medications as per physicians advice (Table 5).

## DISCUSSION

The most common and effective route used for treating asthma patients are inhalation route. There are a lot of advantages associated with the use of inhaler medications

which include site specific delivery and less systemic adverse drug reactions. Use of inhaled medications, when used at the lowest effective dose, also reduces the risk and severity of systemic side effects associated with medication use.<sup>15-17</sup> Their effectiveness in clinical practice can be affected by many factors. The amount of drug reaching the target organ is important for improved efficacy in the treatment of asthma. This in turn depends on the type of inhaler device, technique of inhalation, and patient's compliance to inhalers. The common causes of uncontrolled asthma include incorrect inhaler technique in up to 80% of the patients and at least 50% of the patients show poor adherence.<sup>12,13</sup> Proper technique of

inhaler use improves disease outcome and QOL.<sup>14</sup> Asynchrony during inhalation leads to less delivery of drug at the site.<sup>18</sup> Poor knowledge might lead to faulty technique for using inhaler. Hence, this study was undertaken to assess the adherence and the technique of use of inhaler. Asthma is more prevalent in children and as per the inclusion criteria of this study only adult patients were included.

Of the total 120 patients, there was a female preponderance and most of the patients had been diagnosed with asthma for more than 1 year. Almost 24% of the patients performed the inhaler technique incorrectly. As compared with study done by Şen et al where 65.5% patients showed proper inhalation technique.<sup>19</sup> Out of 29 patient, 18 patients followed all the essential steps of MDI use. This might be because of the ignorance and coordination difficulties. But in patient using MDI with spacer showed less errors. More than half (31/60 MDI) of the patients were using spacers. Various studies reveal that 8.6%, 14%, and 16.7% of the patients were using MDI devices with spacers.<sup>20-22</sup> In contrast to the present study, spacer devices were more frequently used.

Most of the patients followed the step to place the lips tightly around the mouthpiece and to hold the aerosol as indicated in the manufacturer's instructions. Common error performed by patients was not shake inhaler before use and not breathing out fully before inserting the mouth piece in patients on MDI. In patients using MDI the step of breathing out fully was incorrectly performed by 17/60 of the participants in our study. Another study showed, patients using MDI with spacer, the step of breathing out fully was incorrectly performed by 77% of the participants and breathing out away from the device was incorrectly performed in 83% of the participants.<sup>10</sup> About 50% of the patients do not perform the step of proper exhalation before inhalation.<sup>12</sup> Lack of proper exhalation prior to inhalation was one among the three most common errors in 25% of the inhaler users.<sup>23</sup> Hence, a need to emphasize on this step for proper use of inhaler device is essential. Of 120 patients interviewed, only 60% adherent to asthma medications. These included the daily use of a controller medication, sparing use of short-acting bronchodilators and reasonable use of add-on medications.

The improper use of inhalers is not a new phenomenon, but the limited efforts by pharmacists and physicians to ensure that patients are using inhalers correctly is what concern about. The present study puts forward the various factors associated with improper inhaler use which can reduce the delivery of required dose to the lungs. This in turn can attenuate the effectiveness of medication and can be a cause of therapeutic failure. In our study, we found that most patients learned to use inhalers from the physicians who prescribed them. Barriers to effective counseling like lack of time, lack of patients' interest, lack of placebo inhaler devices, and

inadequate staffing do exist. Although excuses for not counselling can easily be offered, the responsibility remains and the effort to counsel should be made in the interest of caring for our patients. Therefore, we suggest that all physicians and pharmacists, regardless of their practice environment, make a conscious effort to ensure that patients prescribed inhalers are using them correctly.

Our study was conducted in a small population at only one site, which will not represent the inhaler practice at the national level. Hence, a multicentric study to assess inhaler technique and different aspects of asthma management is the requisite. A larger population evaluated could also help further identify error trends, such as poor priming, adherence, to help health care personnel focus on particular inhaler steps that are most likely to be performed incorrectly. Use of a video or voice over slide presentation would have been useful in standardizing the orientation procedure.

## CONCLUSION

There are many types of inhalers used by patients. Multiple steps are required for adequate use of different inhalers create the opportunity for patients to misuse their inhalers and limit the health benefits they could receive from them. Proactive efforts by health care personnel should be offered to help patients learn proper inhaler technique when first prescribed these medications, and then routine assessment should occur thereafter, especially in elderly patients, to ensure that proper use continues. Inhaler technique among adult patients is substandard and is a key area for physicians to become more proactive in educating patients. All patients should be given proper instructions regarding inhaler use to obtain therapeutic advantage.

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