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Original Research Article

Incorrect inhaler techniques in Western India: still a common problem

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ABSTRACT

Background: To assess and evaluate the incorrect use of inhalers in patients with asthma and chronic obstructive pulmonary disease (COPD) in the outpatient department of pulmonary medicine at RUHS college of medical sciences Jaipur, Rajasthan, India.
Methods: Patients visiting the outpatient department of respiratory medicine were asked to demonstrate the inhaler technique and were assessed by the physician.
Results: The study included 200 patients with Asthma or COPD. Among patients with COPD, 80 (63.4%) were males and 46 (36.5%) were females. In the asthma group, there were 50 (67.5%) females and 24 (32.4%) males. Patients with COPD were in the age group between 46-82 years with a mean age of 64 years while patients with asthma were in the age group between 18-70 years with a mean age of 44 years. Only 28 (14%) patients could perform all steps correctly in use of inhaler devices. 172 patients (86%) were unable to use inhalers properly. Most common error for metered dose inhalers (MDIs) was in step 7 that is (i.e.) not holding breath for 10 seconds which was seen in 46 patients (51.7%). The most common error seen for dry powder inhalers (DPIs) was in step 5 i.e. exhalation to residual volume before inhalation seen in 50 patients (47.1%).
Conclusions: This study revealed that majority of patients use the inhaler devices incorrectly. Proper education regarding inhaler use is crucial for effective treatment with use of these inhaler devices.

Keywords: Asthma, Chronic obstructive pulmonary disease, Dry powder inhalers, Incorrect technique, Metered dose inhalers

INTRODUCTION

Asthma and Chronic obstructive pulmonary disease (COPD) are common respiratory diseases. Asthma afflicts approximately 1-18% of people in different countries. For COPD, the estimated number of cases in 2010 were 384 million, with a global prevalence of 11.7%.[1,2]

Inhalation therapy for asthma and other diseases has been mentioned in Ayurvedic medicine, whose origins date back 4,000 years.[3] In 1929, in England, Camps evaluated and recommended use of epinephrine via inhalation, and described "spraying it into the tracheobronchial tract."[4]

Presently, many drugs are delivered directly to the lungs in the form of an aerosol. These include short-acting beta 2-adrenergic agonists and long-acting beta 2-adrenergic agonists (LABA), anticholinergics, inhaled corticosteroids (ICSs), nonsteroidal anti-inflammatories, antibiotics and mucolytics.[5] Inhaled therapy has become the mainstay in the treatment of COPD and asthma and proper training is needed for their correct usage.[1,2,6] The use of inhaled route for medication delivery achieves a high concentration of the drug in the airways, a more

rapid onset of action and fewer side effects than systemic delivery.[1]

Devices that are available to deliver these drugs include pressurised metered-dose inhalers (pMDIs), used either alone or attached to spacers or valve holding chambers (VHCs), breath actuated (BA)-pMDIs, dry powder inhalers (DPIs), nebulisers and soft mist inhalers.[5] The incorrect use of inhaler devices remains a hindering factor to achieve optimal disease outcomes.[7]

Proper and correct usage of inhaler devices is one of the most important aspects to be considered when evaluating individuals with asthma or COPD, and guidelines highlight the importance of assessing inhaler technique to improve the efficiency of drug delivery.[1,2] One of the most common reasons for failure to achieve asthma control is inadequate use of inhaler devices.[1]

Incorrect and improper inhaler use is a significant problem for both asthma and COPD management because it may result in diminished therapeutic effect, leading to poor control of symptoms and lacunae in management of these diseases.[8-12]

Moreover, the notion of complexity of inhaled therapy may lead to discontinuation of treatment, further impairing the achievement of disease control.[13] In fact, Santus et al found that 18% of patients stopped inhaled therapy spontaneously, mainly due to the complexity of treatment, despite a reported suitable medical explanation.[14]

Proper usage of inhaler devices needs guidance and education by skilled professionals to help patients understand the basic mechanism of use of the inhaler devices and to overcome the fear they have regarding the use of such devices. The objective of this study was to assess the incorrect use of inhaler techniques in patients with Asthma and COPD.

METHODS

This was an observational study carried out between February 2017 to April 2017 conducted in outpatient department of pulmonary medicine at RUHS College of medical sciences Jaipur, Rajasthan, India. Commonly used inhaler devices were evaluated i.e. pressurized metered dose inhaler, dry powder inhaler, and metered dose inhaler with spacer. The sample size included 200 patients with asthma or COPD. The purpose of study and procedure was explained to all the patients and the patients were included in the study after having given written informed consent.

Inclusion criteria

- Patient with medical diagnosis of Asthma or COPD
- Patients on regular use of inhaled medications
- Patients above 18 years.

Exclusion criteria

- Patients with acute exacerbations in the last 4 weeks.

All the patients were evaluated for the correct use of inhaler technique by the physician. Patients were asked to demonstrate the method in which they use the inhaler devices at home. The following checklist was used to check the technique of the inhaler devices as validated in literature.[15-17] For MDIs:

- Step 1: Remove cap from the mouth-piece of canister, hold upright
- Step 2: For the first use or using after more than 7 days, shake and release one puff into air
- Step 3: Stand or sit straight. Breathe out through the mouth
- Step 4: Place the mouth-piece between teeth and close lips without leaving any gap
- Step 5: Breath in and release one dose with simultaneously breathing in
- Step 6: Remove the inhaler and close the mouth immediately
- Step 7: Hold breath for 10 seconds or if possible
- Step 8: Wait for at least one minute before taking the second dose.

For DPIs

- Keep the rotahaler upright
- Insert rotacap with transparent end down
- Keep rotahaler horizontal
- Rotate both ends to open capsule
- Exhale to residual volume
- Keep rotahaler level and put mouth piece between teeth and lips
- Inhale powder forcefully and deeply
- Remove rotahaler from the mouth and hold breath for 5 seconds
- Exhale away from the mouthpiece
- If any powder is left, repeat steps from 1
- Open the rotahaler and discard the capsule.

When one or more errors were done by patients in using the inhaler devices, the technique was incorrect. After the evaluation, correct technique was demonstrated to each patient.

RESULTS

Total of 200 patients were included in the study.

Disease distribution

There were 126 people with COPD and 74 patients with asthma Figure 1.

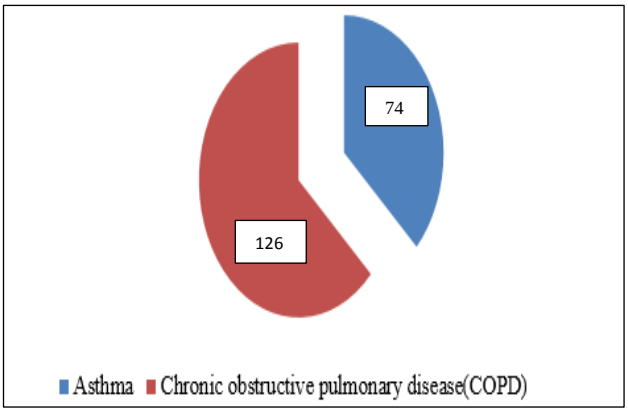

Figure 1: Disease distribution.

Gender

Among patient with COPD, 80 (63.4%) were males and 46 (36.5%) were females. In the asthma group, there were 50 (67.5%) females and 24 (32.4%) males Figure 2.

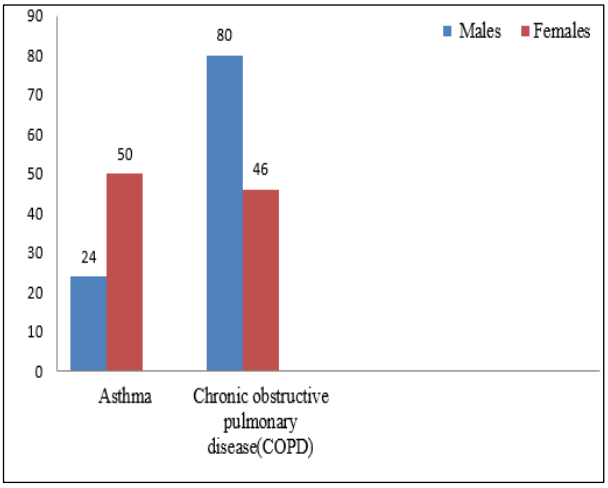

Figure 2: Gender wise distribution of patients.

Age

Patients with COPD were in the age group between 46-82 years with a mean age of 64 years. Patients with Asthma were in the age group between 18-70 years with a mean age of 44 years.

Table 1 shows type of device used which include 106 (53%) patients used DPIs, 89 (44%) patients used MDIs, 5 (3%) patients used MDI with spacer.

Table 1: Type of device used.

Inhaler device	Number of patients
Dry powder inhaler (DPI)	106 (53%)
Metered dose inhaler (MDI)	89 (44%)
MDI with spacer	5 (3%)

Errors in device usage

DPIs

Out of 106 patients receiving DPIs, 16 patients could perform all steps correctly (15%). 90 patients had one or more errors during inhaler technique (84.9%). The most common error seen was in step 5 i.e. exhalation to residual volume before inhalation seen in 50 patients. Next error was in step 8 i.e. to remove rotahaler from mouth and hold breath for 5 seconds, seen in 26 patients (28.8%). 8 patients (8.8%) were unable to exhale away from the mouthpiece (step 9). 6 patients (6.6%) were unable to inhale powder forcefully and deeply.

MDIs

Out of 89 patients using MDI, only 10 patients could demonstrate all the steps of inhaler usage correctly (11.2%). 79 patients (88.7%) had errors in one or more steps of inhaler technique. Most common error was in step 7 i.e. not holding breath for 10 seconds which was seen in 46 patients (51.6%). 30 patients (33.7%) had error in step 3 i.e. exhale to residual volume before inhalation. 3 patients (3.3%) did not remove cap from canister and were unable to hold the inhaler upright (step1). Among 5 patients using MDI with spacer, 2 used it correctly, while 3 patients made mistakes in the step i.e. breathe in and out of the mouthpiece at least three times.

DISCUSSION

This study evaluated the use of diverse types of inhaler devices and the errors made by patients in the use of these devices. In this study only 28 (14%) patients could perform all steps correctly in use of inhaler devices. It was seen that 172 (86%) patients were unable to use inhaler properly out of 200 patients.

Among 106 patients receiving DPIs, 16 patients could perform all steps correctly (15%). while 90 patients had one or more errors during inhaler technique (84.9%). Out of 89 patients using MDI, only 10 (11.2%) patients could demonstrate all the steps of inhaler usage correctly while 79 (88.7%) patients had errors in one or more steps of inhaler technique.

These results are consistent with previous studies. Souza ML et al conducted a study including 120 volunteers: 60 with asthma and 60 with COPD.[18] They found that, only 2 asthma patients and 5 COPD patients performed all the steps correctly when using inhaled medication.113 patients (94.2%) committed at least one error when using the inhalation device. Another study was conducted in Spain, that assessed more than 1,640 European volunteers (746 patients, 466 nurses and 428 physicians) regarding inhalation techniques.[19] It found that only 9% of the patients, 15% of the nurses and 28% of the physicians knew how to use metered-dose inhalers.

Another study, assessing 4,078 asthma patients, found that 71% had difficulty using metered-dose inhalers and that incorrect use was associated with poorly controlled asthma.[20]

An observational study of 140 asthmatic patients showed that most patients use their inhalers incorrectly, whether it is pMDI or DPI. It showed that only 22.1% of pMDI users and 37.3% of DPI users could complete all the steps in their different techniques. About 26.2% of both pMDI and DPI users completed the nine steps without mistakes.[21] In the work by Beerendonk V et al, in the Netherlands, only 11.1% patients completed the required steps.[22] One group of authors showed that, 32% of the 106 asthmatic patients they studied performed all steps of inhalation technique.

The present study evaluated that, most common error among patients using MDIs was in step 7 i.e. not holding breath for 10 seconds which was seen in 46 patients (51.7%). 30 patients had error in step 3 i.e. exhale to residual volume before inhalation (33.7%) while 3 patients did not remove cap from canister and were unable to hold the inhaler upright (step 1) (3.3%). Among 5 patients using MDI with spacer, 2 used it correctly, while 3 patients made mistakes in the step i.e. breathe in and out of the mouthpiece at least three times.

This is like observations made in previous studies. A study conducted by Pothirat et al found that for the pMDI, the steps "breathe out gently to residual volume" and "shake inhaler thoroughly" were most frequently performed incorrectly.[24] For the pMDI with spacer, the step "breathe in and out through mouthpiece at least three times" was most frequently performed incorrectly.

Another study conducted by Jolly GP et al evaluated use of MDIs found that the commonest errors observed were not breathing out of the mouth before inhaling (84.6% of patients), and not holding breath for 10 seconds or more (77.8%).[16]

A group of authors assessed the inhaler techniques among asthma patients in Nigeria and found that in patients using MDIs, the most common errors were step 7 (continue to inhale until the lungs are full), followed by step 6 (Trigger the inhaler while breathing in deeply and slowly).[21] Current study found that among patients using DPIs, the most common error seen was in step 5 i.e. exhalation to residual volume before inhalation seen in 50 patients (47.1%).

Next error was in step 8 i.e. to remove rotahaler from mouth and hold breath for 5 seconds, seen in 26 patients (24.5%). 8 patients were unable to exhale away from the mouthpiece (step 9) while 6 patients were unable to inhale powder forcefully and deeply. A study conducted by Poudel RS et al aimed to evaluate the value of face-to-face training and telephonic reminder for improving rotahaler technique in experienced patients with COPD and found that at baseline assessment most of the patients (16, 80%) failed to breathe out gently before inhalation and hold breath for 10 seconds after inhalation (18, 90%).[25]

Souza ML et al in their study observed that among patients using Aerolizer inhalers, 55 patients (54.5%) did not exhale properly before inhaling the medication.[18] Using metered-dose inhalers, 49 patients (73.1%) did not keep the inhaler at a correct distance from their lips, 41 (61.2%) did not exhale properly before inhaling the medication, 28 (41.8%) did not shake the inhaler before use, and 23 (34.3%) did not exhale slowly during the procedure. Using Pulvinal inhalers, 27 patients (49.1%) did not exhale properly, and 9 (16.4%) did not twist the inhaler until it clicked.

In the present study, only 5 patients used metered dose inhaler with spacer. It has been found that using metered dose inhaler with spacer helps to improve hand -lung coordination.[26] The reason for such few patients using spacer may be related to increased financial costs of the patient or inability to fully understand the purpose of use of spacer or bulky nature.

Poor inhalation technique leads to insufficient medication effects and to the prescription of more or additional medication with a higher probability of side-effects and to increased costs.[27]

CONCLUSION

This study found a high prevalence of incorrect inhaler usage in this region. This issue needs to be addressed so that proper use is ensured among patients for better delivery of medications delivered by aerosols and for better disease management. This study revealed that majority of patients use the inhaler devices incorrectly. Proper education regarding inhaler use is crucial for effective treatment with use of these inhaler devices.

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