

## Comparison of Inhaler Technique in Patients and Health Care Workers

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### Abstract

**Background:** Inhaler devices are often poorly used. There was little information available regarding the use of these devices in health care workers and patients. **Objective:** To compare the knowledge regarding the use of inhaler device in HCW and patients. **Material and Methods:** This study was conducted at a tertiary care hospital, Patiala in which a total of 40 patients with asthma, COPD, and 40 HCW were included. Their knowledge of pMDI technique was assessed by observing the number of steps correctly performed by the subjects. All patients and HCW's were graded out of 10 points for 10 steps performed. These steps were derived from Melani et al.'s study on inhaler mishandling. **Results:** Techniques of 40 patients and 40 HCWs (15 nurses and 25 doctors) were analyzed. Among 40 patients, 20 patients were of asthma and 20 patients were from the COPD group. The average technique score among patients ranged from 0 to 10 with a mean of  $2.60 \pm 2.00$ . The combined score for health care workers ranged from 4 to 9 with a mean of  $6.40 \pm 1.42$ . **Conclusion:** To achieve optimal control of obstructive airway disease, there is a need to educate the patients as well as health care workers regarding the appropriate use of inhaler devices.

**Keywords:** Asthma, COPD, Inhaler devices, Health care workers

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### Introduction

Respiratory diseases like asthma and Chronic Obstructive Pulmonary Disease (COPD) are common causes of morbidity and mortality worldwide.<sup>[1,2]</sup> The mainstays of therapy for obstructive airway disease are bronchodilators. There are various routes, by which there can administer drugs, out of that one of the best routes is inhalational. This route of administration has fewer systemic side effects and action is fast. Because of all these benefits, inhaled medication is preferred over oral in the management of obstructive airway disease.<sup>[3,4]</sup> In 1829, Schneider and Waltz developed a system called "hydroconion" to pulverize and tomize liquids.<sup>[5]</sup> This appliance was used as an inhaler since then.<sup>[6]</sup> Whitlaw, Grey, and Patterson first introduced the word aerosol in 1932 to define the suspension of tiny liquid or solid particles in the air. There are various types of inhaler devices used for the management

of obstructive airway disease,<sup>[3]</sup> including pressure quantitative inhalers (pMDIs), DPis, and soft mist inhalers (SMIs). These pressurized metered-dose inhalers (MDI) were introduced in 1956 and became one of the commonest delivery systems for the introduction of drugs into airways. The advantage of pMDI is that it can be used for any age group like in the old age and pediatric population as no effort is required like in DPI. The disadvantage of pMDI is that it requires hand-mouth coordination and there are various steps to properly use the inhaler technique, which is found to be very complex by the maximum number of patients. So to deliver the optimal amount of drug to the lungs and to master the steps of pMDI, repeated monitoring of inhaler technique is required, and before that teaching of inhaler technique by health care providers was of utmost importance. To get the maximum benefit from the Inhaler devices patients require continuous training. The selection of inhaler devices should be based on availability, cost, patient and physician preference, and clinical setting. Various studies have shown improper use and lack of knowledge of the correct technique regarding the use of inhaler devices among patients with obstructive airway diseases.<sup>[4,5]</sup> Correct inhaler techniques are required for proper delivery of medication and proper control of disease, as concluded by various studies.<sup>[4,6]</sup> There have been studies from the west as well as various parts of Asia and a few from India regarding the use of inhaler devices in patients. Blaiss et al.<sup>[19]</sup> have mentioned that many patients cannot use pMDI correctly, which compromises the treatment of patients with obstructive diseases. A systematic review revealed that about a quarter of patients had never received oral instruction on inhalation techniques. Even for those who had received instruction, the quality and time of training and their mastery of inhalation techniques were not optimal. However, there were very fewer data available on the knowledge of health care workers (HCWs) regarding the use of inhalers. Health-care workers (HCW) play a key role in imparting the correct steps in the MDI technique. However, several studies have shown that there was suboptimal knowledge among HCWs regarding the use of the MDI technique.<sup>[9]</sup> HCW must know the basic steps of the MDI technique because it is, the HCW who will eventually teach the patients.<sup>[2]</sup> In the present study, we evaluated the pressured metered dose inhaler (pMDI) technique of adult patients with asthma and COPD as well as the HCWs (doctors and nurses) in Govt medical college, Patiala.

### **Materials and Methods**

This was a descriptive cross-sectional study, where all diagnosed cases of asthma and COPD, who presented to the Department of Pulmonary Medicine, at a tertiary care hospital, Patiala, Punjab, were included. Baseline data on demographics and symptoms at presentation were also collected. 80 subjects were included in this study out of which 40 were health care workers and 40 were patients (20 patients with asthma, 20 patients with COPD). The sample consisted of male and female patients with a diagnosis of asthma and COPD based on spirometry, in accordance with the Global Initiative for Asthma, and Global initiative for chronic obstructive lung disease. Patients having stable diseases were evaluated who were presenting to outpatient clinics for regular follow-up visits.

### **Inclusion criteria**

- 1) Adult patients of asthma and COPD (age >18 years), using pMDI's, consenting to be part of the study.
- 2) Patients using an inhaler for at least 1-month duration.

### **Exclusion criteria**

- 1) Patients <18 years of age.
- 2) Patients using inhalers other than pMDI, and those not consenting to be part of the study.

- 3) Patients who had a respiratory comorbidity or any concomitant condition that could directly affect inhaler technique (prostration, oxygen dependence, or altered cognitive status).

Detailed history and examination were done for every patient and all relevant investigation were done including chest x-ray and spirometry. The age, educational status, gender, and duration of illness were recorded in a proforma. Similarly, the age and gender of HCW's was also noted. All patients and HCW's were graded out of 10 points for the following 10 steps, derived from Melani et al study on inhaler mishandling.<sup>[4]</sup>

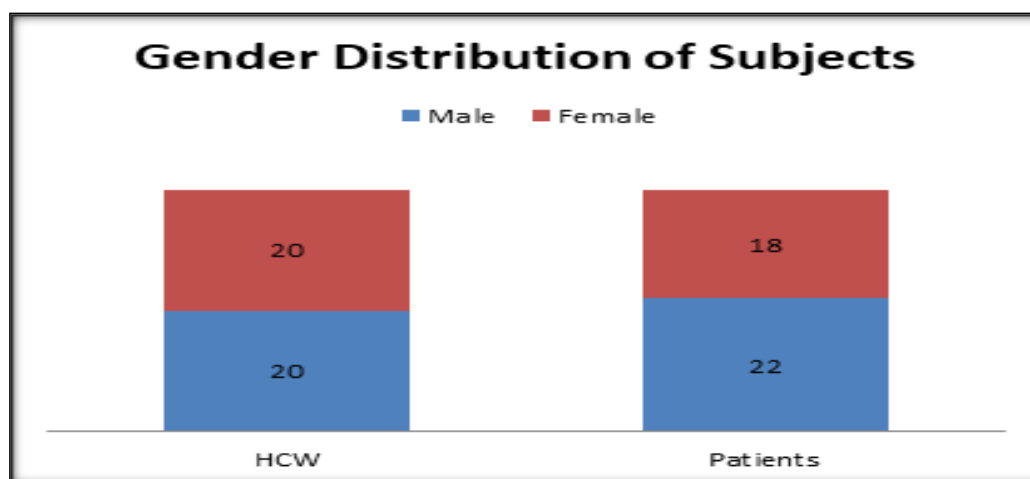
Step Number	Description
1	Remove mouthpiece cap
2	Shake Inhaler
3	Breathe out before firing
4	Inhaler upright during firing
5	One Inhalation for actuation
6	Place mouthpiece between lips and over the tongue
7	Actuation in the first half of Inhalation
8	Fire while breathing in deeply and slowly and continue until total lung capacity
9	Inhalation by mouth
10	Hold the breath for 10 s after inhalation

On the assessment day, they were asked to use their inhaler as they were using it regularly. All volunteers used their pMDI. The number of steps correctly performed by patients and HCW were noted and scoring was done accordingly.

### Statistical Analysis:

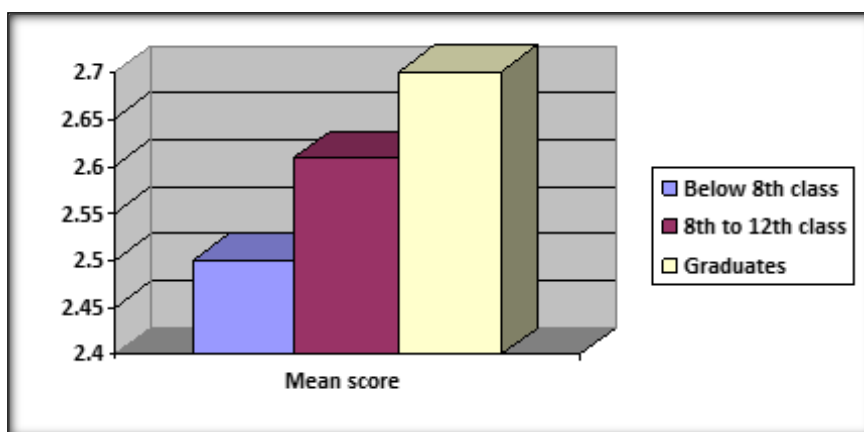
The mean and standard deviation was calculated for quantitative variables. The educational status was classified into (1) underclass 8; (2) up to class 12; (3) graduation and beyond. The technique score was correlated with age and duration of illness using the Spearman's rho coefficient and linear regression. The technique score of various educational strata was compared using a nonparametric t-test. The average technique scores between various groups were compared using the nonparametric t-test.  $P = 0.05$  was taken as significant

### Results

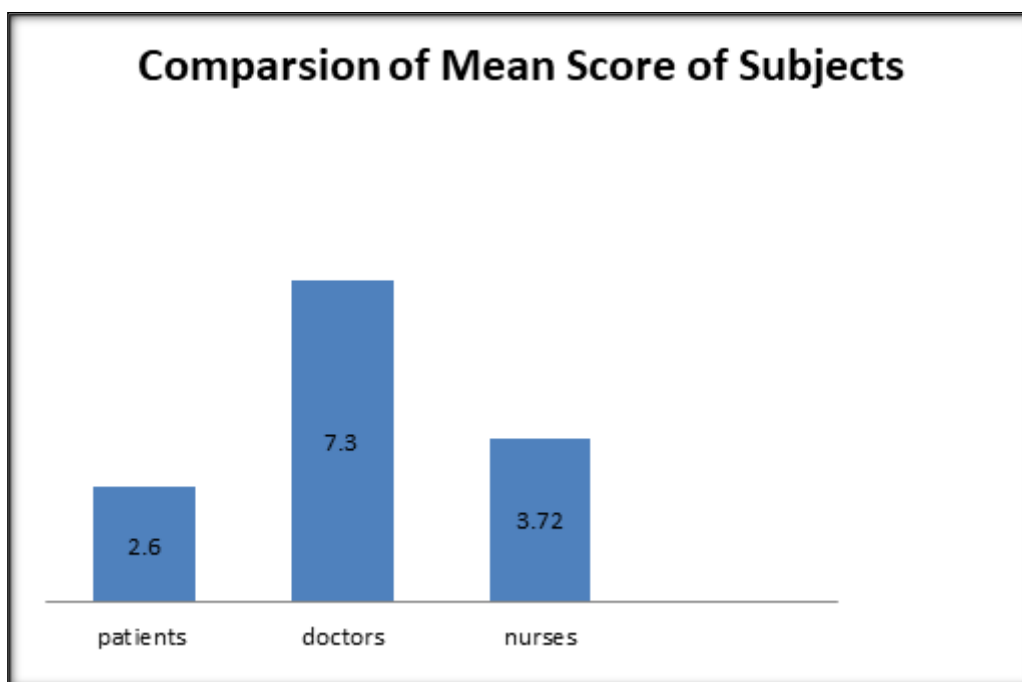


In this study, pMDI techniques of 40 patients(20 patients of asthma and 20 patients of COPD) and 40 HCW's (15 nurses and 25 doctors) were analyzed. The age of patients varied from 18 to 55 years with a mean of  $32.08 \pm 2.15$ yr. The age of nurses varied from 23 to 50 years with a mean of  $26 \pm 2.75$ yr. The age of doctors varied from 26 to 55 years with a mean of  $33 \pm 1.90$ .

Out of total patients 18 females and 22 males were included in this study. Of the 15 nurses, there were 5 males and 10 females. Of the 25 doctors, 15 were males and 10 were females. Dividing the education status as described earlier, we had 20 patients below class 8, 12 patients between class 8 and 12, and 8 graduates. The technique score in the three groups was similar with a mean of 2.50, 2.61, and 2.70, respectively ( $P > 0.05$ ) as shown in the bar chart.



The average technique score among patients ranged from 0 to 10 with a mean of  $2.60 \pm 2.00$ . The combined score for health workers ranged from 4 to 9 with a mean of  $6.40 \pm 1.42$ . Doctors had a higher score of  $7.30 \pm 1.33$  as opposed to the nurses' score of  $3.72 \pm 1.10$  ( $P < 0.05$ ). There was no significant difference between the scores of nurses and patients ( $P > 0.05$ ).



The most common errors in all three groups were: (1) Step 8: Fire while breathing in deeply and slowly and continue until total lung capacity, (2) Step 10: Hold the breath for 10 s after inhalation in decreasing order, and (3) Step 4: Inhaler upright during firing.

**Table 2: Score distribution of patients- Maximum score of 10 was found in only one patient of asthma who was a graduate and from high socioeconomic strata. A maximum number of patients (9) have a score of four. There were very less number of patients as shown in the table having a score on the higher side, only 2 patients have a score of nine, five patients have a score of eight, and only four patients were having a score of 7.**

Score	N(40)
0	1
1	2
2	2
3	4
4	9
5	5
6	5
7	4
8	5
9	2
10	1

**Table 3: Score distribution of HCW- As shown in the table not even a single health care worker was having a score of 10. Only 3 HCWs have a score of 9 and 5 were having a score of eight. The maximum number of HCWs that is 14 has a score of 6. Although no HCWs have a score of 3 or less. Out of total 9 HCWs have a score of 5 which is having 50% knowledge about the use of inhaler device.**

Score	N(40)
4	5
5	9
6	14
7	4
8	5
9	3

## Discussion

India has a large population of COPD and asthmatics with a prevalence of 2–2.5% translating to absolute numbers of 20–25 million.<sup>[9]</sup> The use of inhaled medication forms a cornerstone of treatment for both asthma and COPD. The correct use of inhalers is essential for the optimal effect of inhalational therapy. Even with the best techniques, the amount of drug delivered to the lungs is about 15–20%.<sup>[10]</sup> Our study has identified that there is a need for improvement in the technique of inhaler use by health care professionals as well as for patients.

The poor inhaler technique of asthmatics and COPD seems to be common in other studies not only in India but also in other countries, especially in the Indian subcontinent and South-East Asia.<sup>[11-13]</sup> Various studies have also shown that there was worsening disease control and quality of life in patients due to poor inhaler technique. To teach good techniques to patients, health care providers need to be well trained. Our study showed that doctors and nurses also made multiple errors in using inhalers. Although the scores of doctors were significantly

better as compared to nurses and patients, it was still inadequate compared to the total score. It has been observed that even individuals with the correct inhaler technique can make errors if they don't follow the teach-back method. So our study results concluded that we need to reinforce the inhaler technique both for patients and health care workers time again. Many factors hinder this learning process for patients, like limited duration of appointments, a lack of knowledge on the part of health care personnel about the correct steps of the inhaler technique, and the technical language used in teaching the technique. There have been studies describing the inhaler technique among doctors and nurses.<sup>[14]</sup> In a study from Gujarat involving medical interns, only 34% could properly use a pMDI.<sup>[15]</sup> A study from Nepal showed that the technique of pMDIs among HCWs was poor and needed further education and training.<sup>[16]</sup> In a study from Iran, which included physicians and nurses, only 6.93% could demonstrate MDIs correctly.<sup>[17]</sup> In another study from Oman, 15% of respondents performed all the steps correctly.<sup>[18]</sup> Our study results were in concordance with these studies' results, which shows that doctors and nurses need to understand the importance of spending a good amount of time teaching inhaler techniques to patients and also learning it time and over again.

Our study highlights the need for better education of not only patients but also health care providers regarding the appropriate use of inhaler devices to achieve optimal control of obstructive airway diseases. The poor knowledge of the doctors and medical staff reveals the need for educational intervention among them as well. One of the better approaches could be, to include changes in the medical curriculum, which incorporate the issues like MDI demonstration. We now make sure that the inhaler technique of every patient is checked and reinforced at every follow-up visit. Furthermore, the HCWs are provided training regarding the same regularly. The overall poor knowledge of the healthcare professionals also necessitates alternative methods to overcome this problem. One of the methods could be providing patient information leaflets to all the patients who are being prescribed MDIs. These leaflets should be made in the local language, and should also incorporate pictorials.

#### **Limitation of Study:**

- Our study had a limitation that we checked the techniques of pMDIs only.

#### **Strength of Study:**

- We have included both patients and health care workers.
- Both patients with asthma and COPD were evaluated simultaneously.

#### **Conclusion**

There was no statistically significant difference between the knowledge of patients and medical staff. This is an issue of concern that we need to address and improve the technique of both the patients and staff nurses so that there can be an appropriate spread of knowledge and good improvement in patient health outcomes. Other than this, the doctor's knowledge about inhaler technique should be reinforced repeatedly by various demonstrations and workshops so that they can provide benefit to maximum number of patients.

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