Research Article

Assessment of inhalation technique among patients attending a tertiary-care hospital

Mukul Saxena[1], Mohammad Shibly Khan[2], Anil K Sharma[3]

[1]Department of TB and Chest Diseases, FH Medical College and Hospital, Tundla, Firozabad, Uttar Pradesh, India.
[2]Department of Community Medicine, Jawaharlal Nehru Medical College, Aligarh, Uttar Pradesh, India.
[3]Department of Medicine, FH Medical College and Hospital, Tundla, Firozabad, Uttar Pradesh, India.
Correspondence to: Mohammad Shibly Khan, E-mail: shibly001@gmail.com

Received February 4, 2016. Accepted February 20, 2016

Abstract

Background: A large population in India experience chronic respiratory diseases and get inhaled therapy as treatment. Faulty inhalation techniques among patients lead to improper control of the disease.

Objective: To assess the accuracy of inhalation techniques among patients using dry powder inhalers and its association with certain sociodemographic correlates.

Materials and Methods: A cross-sectional hospital-based study was conducted at the Department of TB and Chest Diseases, FH Medical College and Hospital, Tundla, Firozabad, Uttar Pradesh. Patients of chronic obstructive pulmonary disease and bronchial asthma using dry powder inhalers attending TB and Chest Diseases Outpatient Department and Inpatient Department were observed while using the inhaler. Individual steps of the inhalation technique were analyzed for their correctness and recorded on a predesigned, pretested structured format.

Result: Only 14.9% (14 of 94) patients were observed to be performing all steps correctly. The most crucial steps which most of the subjects were found to be performing incorrectly were found to be forceful inhalation through the mouth (71.7%), slow exhalation (70.2%), breath holding after inhalation (69.1%), and continuing to inhale until lungs were full (44.7%). No significant association was noted between frequency of mistakes and sociodemographic variables such as age, sex, education, or residence.

Conclusion: It was observed that majority of patients were unable to use their inhalers correctly; thus, proper training at each visit should be carried out to get maximum benefit from inhalers.

KEY WORDS: Inhaler technique, DPI, COPD, asthma

Introduction

Respiratory diseases are an important public health concern of the modern world, contributing to about 4 million deaths annually on worldwide scale.[1] India is also facing a constant threat from these diseases where they have been estimated to affect millions of population. Chronic obstructive pulmonary disease (COPD) is termed as an epidemic by virtue of posing a huge burden which is of longer duration.[2] The burden of asthma and COPD in India has been estimated to be 17.23 and 14.84 million, respectively,[3] as revealed in a multicentric study conducted across different parts of India. Inhaled therapy is now established as the mainstay of treatment for both COPD and asthma.[4,5] While the correct treatment and the compliance of the patient are the factors that are required for controlling the disease severity, correct and proper use of the inhaler device by the patient is another issue that is equally important as well as overlooked. The studies conducted on this very subject have reported very bothersome findings such as, in a systematic review, it has been reported that between 4% and 94% of patients using a dry powder inhaler (DPI) do not use it correctly, while as much as 25% have never received inhaler-technique training.[6]

Access this article online	
Website: http://www.ijmsph.com	Quick Response Code:
DOI: 10.5455/ijmsph.2016.04022016388	

International Journal of Medical Science and Public Health Online 2016. © 2016 Mohammad Shibly Khan. This is an Open Access article distributed under the terms of the Creative Commons Attribution 4.0 International License (http://creativecommons.org/licenses/by/4.0/), allowing third parties to copy and redistribute the material in any medium or format and to remix, transform, and build upon the material for any purpose, even commercially, provided the original work is properly cited and states its license.

Inhalation therapy guidelines have been prescribed for each type of inhaled therapy. The steps to be taken for DPI devices are as follows[7]: (1) Take the cap off (some do not have a cap); (2) Follow the dose preparation instructions in the patient information leaflet; (3) Do not point the mouthpiece downward once a dose has been prepared for inhalation because the dose could fall out; (4) Exhale slowly, as far as comfortable (to empty the lungs). Do not exhale into the DPI; (5) Start to inhale forcefully through the mouth from the very beginning. Do not gradually build up the speed of inhalation; (6) Continue inhaling until the lungs are full; (7) At the end of the inhalation, take the inhaler out of the mouth and close the lips. Continue to hold the breath for as long as possible or up to 10 s; (8) Breathe normally; and (9) If another dose is required, repeat steps 1–7.

This study attempts the assessment of the correct inhalation techniques among patient using DPI, presenting to the TB and Chest Diseases Department in FH Medical College and Hospital, with the following aims and objectives: (1) to assess the accuracy of inhalation techniques among patients using DPI, (2) to find out the steps in which patients make the maximum number of mistakes while using these devices, and (3) to examine certain sociodemographic determinants associated with accuracy of inhalation technique.

Materials and Methods

Study Setting and Sample Size

This hospital-based study was conducted on a purposive (nonrandom) sample of patients attending the Department of TB and Chest Diseases, FH Medical College and Hospital, Tundla, Firozabad, Uttar Pradesh for a period of 3 months. Patients attending the OPD and IPD, fulfilling the inclusion criteria and consenting to take part in the study, were included.

Inclusion Criteria

Adult patients of bronchial asthma and COPD using DPI's for at least 1 month or more, who give informed consent.

Exclusion Criteria

Patients using DPI for less than 1 month, using devices other than DPI, admitted with acute exacerbations and those who denied consent.

Data Collection

The sociodemographic information of the subjects was noted on preformed, structured format. Patients were asked to demonstrate the inhalation technique, which was observed by a single observer, and errors made by patients at individual steps were recorded. Proper training and counseling was provided to patients after observation of the inhalation technique about the errors made and how to correctly use a DPI.

Statistical Analysis

Data collected so were presented as frequencies and proportion in tabular form. Appropriate test of significance such as χ^2-test was used, wherever applicable.

Ethical Consideration

Formal approval was taken from the institutional ethical committee, FH Medical College and Hospital, Tundla, Firozabad, Uttar Pradesh.

Result

Most of the study subjects were male subjects (70%). The mean age of the study subjects was found to be 51 ± 14 years. About 56% (53 of 94) and 43% (41 of 94) hailed from the urban and rural areas, respectively. The educational status of the participants was reported to be as follows: 41% (39 of 94) were illiterates, 8.5% (8 of 94) up to primary school, 13.8% (13 of 94) middle school, 19.1% (18 of 94) high school/diploma, 9.6% (9 of 94) intermediate, and only 7.5% (7 of 94) were graduate and above. About 62.8% (59 of 94) were experiencing COPD, while 37.2% (35 of 94) were patients of bronchial asthma. Majority of the patient (69%) reported to be using the DPI for less than 1 year, and, in most of the cases (47.9%), the training was provided by the physician, while in the rest of the cases, the instructions were provided by pharmacist (13.8%), nurse (9.6%), self-learned (9.6%), and others (19.6%).

While assessing the overall technique, it was noted that only 14.9% (14/94) patients were observed to be performing all steps correctly, majority [i.e., about 60.6% (57 of 94)] were doing faults at least (any) 4 to 7 steps, while about 24.5% (23 of 94) were making mistakes in any 1 to 3 steps. (Table 2) The proportion of mistakes made at individual step among the study subjects is shown in Table 1. The most crucial steps which most of the subjects were found to be performing incorrectly were found to be step 5 [i.e., forceful inhalation through the mouth (71.7%)], followed by step 4 [i.e., slow exhalation (70.2%)], followed by step 7 [i.e., breath holding after inhalation (69.1%)] and step 6 [i.e., continuing to inhale until lungs were full (44.7%)].

Table 3 shows the association of inhalation technique with certain sociodemographic and other variables. The frequency of 4–7 incorrect steps was higher among female subjects and lower age groups, although the association was not found to be significant ($p > 0.05$). No significant association was observed between the correctness of the technique with area of residence and educational status of the respondents ($p > 0.05$). Although the patients of bronchial asthma were observed to be performing well as those with COPD, but this was not found to be statistically significant ($p > 0.05$). Similarly, no significant association was found between correctness of technique with role of guide ($p > 0.05$).

Discussion

This is a hospital-based study that was conducted on 94 patients attending the Department of TB and Chest Diseases in a tertiary-care hospital to assess the correctness of inhaler technique among its users. Majority of the subjects (69%) in our study were using the inhaler for less than 1 year

Table 1: Frequency of mistakes made at individual steps (*N* = 94)

Step	Frequency (%)
Step 1 (Removing the cap)	4 (4.3)
Step 2 (Dose preparation)	13 (13.8)
Step 3 (Do not point the mouthpiece downward)	21 (22.3)
Step 4 (slow exhalation)	66 (70.2)
Step 5 (forceful inhalation through the mouth)	67 (71.7)
Step 6 (continuing to inhale until lungs were full)	42 (44.7)
Step 7 (breath holding after inhalation)	65 (69.1)

Table 2: Assessment of correct inhaler technique (*N* = 94)

Number of steps	Frequency (%)
All steps correct	14 (14.9)
1–3 steps incorrect	23 (24.5)
4–7 steps incorrect	57 (60.6)
Total	94 (100)

Table 3: Association of incorrect inhalational technique with certain sociodemographic and other variables (*N* = 94)

Variable	Frequency of incorrect steps			Statistical significance
	No mistake	1–3 steps	4–7 steps	
Gender				
Male (*n* = 66)	11 (16.6)	17 (25.8)	38 (57.6)	$p = 0.618$, $\chi^2 = 0.96$.
Female (*n* = 28)	3 (10.7)	6 (21.5)	19 (67.8)	
Age (years)				
<40 (*n* = 28)	5 (17.9)	6 (21.4)	17 (60.7)	
40–49 (*n* = 18)	4 (22.2)	2 (11.1)	12 (66.7)	$p = 0.612$, $\chi^2 = 4.48$.
50–59 (*n* = 22)	3 (13.6)	6 (27.3)	13 (59)	
> 60 (*n* = 26)	2 (7.7)	9 (34.6)	15 (57.7)	
Area of residence				
Urban (*n* = 53)	9 (16.9)	12 (22.6)	32 (60.4)	$p = 0.77$, $\chi^2 = 0.523$.
Rural (*n* = 41)	5 (12.2)	11 (26.8)	25 (61)	
Educational status				
Illiterate (*n* = 39)	4 (10.3)	6 (15.4)	29 (74.3)	
Primary (*n* = 8)	1 (12.5)	5 (62.5)	2 (25)	
Middle school (*n* = 13)	1 (7.7)	2 (15.4)	10 (76.9)	$p = 0.171$, $\chi^2 = 14$.
High school/diploma (*n* = 18)	5 (27.8)	4 (22.2)	9 (50)	
Intermediate (*n* = 9)	2 (22.2)	2 (22.2)	5 (55.6)	
Graduate and above (*n* = 7)	1 (14.3)	2 (28.6)	4 (57.1)	
Diagnosis				
Bronchial asthma (*n* = 35)	7 (20)	8 (22.9)	20 (57.1)	$p = 0.56$, $\chi^2 = 1.148$.
COPD (*n* = 59)	7 (11.9)	15 (25.4)	37 (62.7)	
Duration of use (years)				
<1 (*n* = 64)	7 (10.9)	14 (21.9)	43 (67.2)	$p = 0.130$, $\chi^2 = 4.08$.
>1 (*n* = 30)	7 (23.3)	9 (30)	14 (46.7)	
Guide				
Doctor (*n* = 45)	9 (20)	15 (33.4)	21 (46.6)	
Nurse (*n* = 9)	2 (22.2)	1 (11.1)	6 (66.7)	$p = 0.128$, $\chi^2 = 9.92$.
Pharmacist (*n* = 13)	2 (15.4)	1 (7.7)	10 (76.9)	
Others (*n* = 27)	1 (3.7)	6 (22.2)	20 (74.1)	

and about 47% were trained for inhaler use by physician. The frequency of subjects performing the inhaler technique correctly was found to be 14%. Most of the subjects (71%) were found to be performing "incorrect forceful inhalation through the mouth," followed by failure to correctly doing slow exhalation before taking the inhalation (70%).

Similar to ours, in another study, about 16% DPI users were found to be performing inhaler technique incorrectly.[8] In a

study conducted among the pMDI (pressurized metered-dose inhaler), about 21% users were found to be inhaling incorrectly, while the most common step performed to be incorrect was observed to be exhalation.[9] About 24.2% subjects have been reported to be performing at least one essential step incorrectly in a study.[10] In a study conducted among asthma patients, about 30% subjects were found to be using their inhaler correctly.[11] In our study, no significant association was observed between correct inhalation practices with socio-demographic or other variables, similar results have been shown by other studies also.[8,9]

A great majority of study subjects were using the inhaler incorrectly in our study, which highlights the importance of proper training and follow up of subjects. The increasing burden of respiratory diseases warrants the optimal patient education for proper use of inhalers. This study focuses on the very topic of doctor–patient relation in a traditional sense of considering the doctor as a teacher. Despite putting a lot of resources, these diseases are adding to the agony of the patients which can effectively be reduced by ensuring the correct use of these devices. However, considering the shortage of time with the attending physician, it may be recommended that other paramedical workers to be deputed for training and counseling the patients regarding inhaler use.

Limitations

As the subjects were told to perform the inhaler technique and that they would be observed whether they were doing it correctly or not, so there is a possibility that they might had done it erroneously under the pressure of being observed, so there may be overreporting of the faulty techniques in this study. Nonetheless, the incorrect inhaler use has been found to be high in this study which is a cause of concern.

Conclusion

It was observed that majority of patients were unable to use their inhalers correctly; thus, proper training at each visit should be carried out to get maximum benefit from inhalers.

Acknowledgment

We are thankful to the patients who participated in the study.

References

1. World Health Organization. *Noncommunicable Diseases*. Geneva, WHO: 2015. Available at: http://www.who.int/mediacentre/factsheets/fs355/en/ (last accesssed on February 3, 2016).
2. Jindal SK. COPD: the unrecognized epidemic in India. J Assoc Physicians India 2012;60:14–6.
3. Jindal SK, Aggarwal AN, Gupta D, Agarwal R, Kumar R, Kaur T, Chaudhry K, Shah B. Indian study on epidemiology of asthma, respiratory symptoms and chronic bronchitis in adults (INSEARCH). Int J Tuberc Lung Dis 2012;16:1270–7.
4. *Global Strategy for Asthma Management and Prevention*. Available at:http://www.ginasthma.org/local/uploads/files/GINA_Report2015_Tracked.pdf (last accesssed on February 3, 2016).
5. Gupta D, Agarwal R, Aggarwal AN, Maturu VN, Dhooria S, Prasad KT, et al. Guidelines for diagnosis and management of chronic obstructive pulmonary disease: Joint ICS/NCCP (I) recommendations. Lung India 2013;30(3):228–67.
6. Lavorini F, Magnan A, Dubus JC, Voshaar T, Corbetta L, Broeders M, et al. Effect of incorrect use of dry powder inhalers on management of patients with asthma and COPD. Resp Med 2008;102(4):593–604.
7. Laube BL, Janssens HM, de Jongh FHC, Devadason SG, Dhand R, Diot P, et al. What the pulmonary specialist should know about the new inhalation therapies. Eur Respir J 2011;37(6):1308–417.
8. Ganguly A, Das AK, Roy A, Adhikari A, Banerjee J, Sen S. Study of proper use of inhalational devices by bronchial asthma or COPD patients attending a tertiary care hospital. J Clin Diagn Res 2014 1;8(10):HC04–7.
9. Sehajpal R, Koolwal A, Koolwal S. Assessment of inhalation technique of bronchial asthma and chronic obstructive pulmonary disease patients attending tertiary care hospital in Jaipur, Rajasthan. Indian J Allergy Asthma Immunol 2014;28(2):78–82.
10. Hesselink AE, Penninx BW, Wijnhoven HA, Kriegsman DM, van Eijk JT. Determinants of an incorrect inhalation technique in patients with asthma or COPD. Scand J Prim Health Care 2001;19(4):255–60.
11. Al-Rawas OA, Jayakrishnan B, Ben Abid F, George J, Baddar SA, Al-Riyami BM. Management and control of asthma in patients attending a specialist centre in Oman. Sultan Qaboos Univ Med J 2009;9(2):132–9.

How to cite this article: Saxena M, Khan MS, Sharma AK. Assessment of inhalation technique among patients attending a tertiary-care hospital. Int J Med Sci Public Health 2016;5: 1916-1919

Source of Support: Nil, **Conflict of Interest:** None declared.