



STUDY OF PROPER USE OF INHALATION DEVICES BY PATIENTS OF COPD AND ASTHMA

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INTRODUCTION:

Bronchodilators and corticosteroids are crucial for asthma and chronic obstructive pulmonary disease (COPD) patients to maintain disease control.(1) Anti-asthma and chronic obstructive pulmonary disease (COPD) drugs are best delivered by inhalation.(2) Inhalation of respiratory drugs results in a higher concentration in the airways, a faster onset of action, and less systemic side effects than systemic administration. However, in order for the drug to be delivered efficiently, using an inhaler is a skill that must be learned and practised.(3)

Each form of inhaler has its own set of instructions for use. Patients are seldom given just one inhaled medication, and each medication comes in a limited number of formulations and inhaler sizes. As a result, there's a chance that devices will get mixed up. A pMDI, for example, necessitates a slow inspiratory flow rate, while a DPI demands rapid inhalation. When a patient inadvertently uses these inhalers with the incorrect flow pattern, the volume of medicine inhaled is significantly reduced.(4)

GINA 2021 reports that around 80% of patients of Bronchial Asthma have poor inhalational techniques. (3)

Using a standardised checklist to verify and correct inhaler technique takes just 2-3 minutes and leads to better asthma and COPD control. (5)(6) To improve inhaler technique, a physical demonstration is necessary. (7) The patient sooner or later forgets some of the steps after training, so testing and retraining must be done on a regular basis. This is especially significant in patients who have poor symptom control or have had exacerbations in the past.(3)

The aim of this study was to analyse the use of inhaler devices by the patients according to the standard steps and to evaluate the correlation of correct use of inhalational device with the age of patient and the qualification of personal who imparted training.

MATERIAL AND METHODS:

This was an observational questionnaire based study. This study did not intervene in the treatment protocol. Patients of COPD or Bronchial Asthma attending the department of pulmonary medicine of HNB Base Hospital, Srinagar, Uttarakhand from 1st September 2020 to 1st May 2021 (8 months) were taken. Patients diagnosed as COPD or Bronchial Asthma, aged 18 years or more and already on inhaler therapy were included in the study. Patients who required hospitalisation or nebulizer therapy on visit were excluded from the study.

Upon visit to the outpatient department of Pulmonary Medicine, patient of COPD or Bronchial Asthma was screened for inclusion and exclusion criteria. Informed written consent was taken and some demographic details were recorded of each patient. Each patient was asked to show his/her technique of inhalational device usage. Each step was observed carefully and noted for errors against a standard

checklist. After assessing the patient's inhalational method, proper inhalational technique would be imparted to the patient by pulmonary medicine specialist.

Standard Checklist:**1. MDI (pressurized metered dose inhaler) suggested checklist:**

- I. Remove Cap
- II. Hold inhaler upright and shake well
- III. Breathe out gently
- IV. Put mouthpiece between teeth without biting and close lips to form good seal
- V. Start to breathe in slowly through mouth and press down firmly on canister
- VI. Continue to breathe in slowly and deeply
- VII. Hold breath for about 10 seconds or as long as comfortable
- VIII. While holding breath, remove inhaler from mouth
- IX. Breathe out gently away from the mouthpiece
- X. If an extra dose is needed, wait for 1 minute and then repeat steps 2 to 9
- XI. Replace cap

2. MDI (pressurized metered dose inhaler) with spacer suggested checklist:

- I. Assemble spacer
- II. Remove inhaler cap
- III. Hold inhaler upright and shake well
- IV. Insert inhaler upright into spacer
- V. Put mouthpiece between teeth without biting & close lips to form good seal
- VI. Breathe out gently
- VII. Hold spacer level and press down firmly on canister once
- VIII. Breathe in slowly and deeply, then hold breath for about 10 seconds or as long as comfortable or breathe in and out normally for 4 breaths
- IX. Remove spacer from mouth
- X. Breathe out gently
- XI. Remove inhaler from spacer
- XII. If an extra dose is needed, wait for 1 minute and then repeat steps 3 to 11
- XIII. Replace cap and disassemble spacer

3. DPI (ex. Breezhaler) suggested checklist:

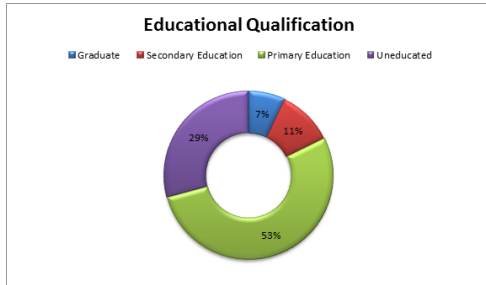
- I. Remove cap
- II. Flip mouthpiece to open
- III. Remove capsule from blister and place in chamber
- IV. Close mouthpiece until it clicks
- V. Press side buttons in once and release (do not shake)
- VI. Breathe out gently, away from inhaler
- VII. Put mouthpiece between teeth without biting & close lips to form good seal
- VIII. Breathe in quickly and steadily, so capsule vibrates
- IX. Hold breath for about 5 seconds, or as long as comfortable
- X. While holding breath, remove inhaler from mouth

- XI. Breathe out gently, away from inhaler
- XII. Open mouthpiece and remove capsule
- XIII. If more than one dose is needed, repeat steps 3 to 12
- XIV. Close mouthpiece and cap

RESULTS:

A total of 113 patients, that either had COPD or Bronchial Asthma, attended the OPD of Pulmonary medicine in 8 months. Out of these 113 patients, 67 (59%) patients were of Bronchial Asthma and 46 (31%) patients of COPD.

The minimum age of the patient was 18 years and maximum age was 85 years. The average age of patients was 46.61 years. Maximum patients (35) were in the age group of 46-60 years, followed by 33 in the age group of 31-45 years, 21 each in age groups 18-30 years and 60-75 years, and only 3 patients aged above 75 years. 70 (61.4%) patients were male while 43 (38.6%) were female.



33 subjects did not have any type of formal education, 60 subjects had primary education, 12 subjects had completed their secondary education and only 8 subjects were graduates.

Among subjects 35 were smoker, 26 ex-smokers & 52 non-smokers. 51 subjects were exposed to biomass fuel while 62 did not have biomass fuel exposure. Among whole population (n=113), 89 are trained by medical persons (doctors, nurse, pharmacists, or medical representatives of Pharmaceutical companies) and 24 are trained by others like family members, neighbors, friends. 11.24 % of (10) patients trained by a medical person could do the inhalational technique correctly while 9.09% of (2) patients trained by a non medical person correctly performed inhalational technique.

Trainer	Correctly done	Incorrectly done	Total
Medical Person	10	79	89
Non medical person	2	22	24
Total	12	101	113

Distribution of type of trainer to correct/incorrect inhalational technique of individual subject

Age Group	Correctly done	Incorrectly done	Total
18-30 years	3	18	21
31-45 years	4	29	33
46-60 years	3	32	35
61-75 years	2	19	21
>75 years	0	3	3
Total	12	101	113

Distribution of age group to correct/incorrect inhalational technique of individual subject

Among 18-30 year age group 3 (16.67%) patients performed correctly, in age group 31-45 years 4 (13.79%), among age group 46-60 years 3 (9.38%), among ages 61-75 years 2(9.52%) patients out of 21 while no patient in more than 75 years age group could perform inhalational technique correctly.

Distribution of wrongly done steps in MDI users		Distribution of wrongly done steps in MDI with spacer users		Distribution of wrongly done steps in DPI users	
I	0	I	1	I	0
II	21	II	0	II	3
III	16	III	3	III	4
IV	3	IV	0	IV	1
V	6	V	2	V	7
VI	18	VI	6	VI	42
VII	21	VII	5	VII	21
VIII	19	VIII	4	VIII	26
IX	12	IX	3	IX	37

X	6	X	4	X	41
XI	2	XI	2	XI	19
Total	124	XII	4	XII	17
		XIII	0	XIII	14
		Total	34	XIV	0
				Total	232

Distribution of wrongly done steps in subjects during inhalation with different inhalational devices

DPI was being used by 69 subjects, MDI by 33 subjects and MDI with spacer was being used by 11 subjects. The participants doing all steps correctly are (7)10.1% among the DPI users, (2) 6%, among MDI users and (3) 27.3% among MDI with spacer users.

DISCUSSION:

In Indian patients, correctly using various devices as inhaler medications is a tough task, particularly when considering their academic and socioeconomic backgrounds. (8)GINA 2021 reports that around 80% of patients of Bronchial Asthma have poor inhalational techniques. (3) In our study, only 12 out of the total 113 patients i.e only 10.62% of the subjects could perform inhalational technique correctly. Although there is a minor difference between the proportion of correctly performing individuals trained by medical and non-medical persons (11.24% vs. 9.09%).

Technique of inhalation that was found to be done most effectively by the patients was found to be of MDI with spacers. 27.3% of MDI with spacer users did not commit a single mistake while performing the inhalational technique, which was far more than individuals on DPI (10.1%) and MDI only (6%). One important cause of poor disease control is poor inhaler guidance and technique, which influence the amount of medication that enters the lungs and therapy compliance. Poor pMDI technique leads to a reduction in respiratory deposition and, as a result, a reduction in the bronchodilator effect. (9,10)

It was also seen in this study that comparatively the younger population (18-30 years age group) performed better as compared to the older age groups. This may be due to the fact that the younger age group understood the instructions more easily and retained the instructions for a longer time.

At the time of this study few international and national studies were done for inhalational technique of various inhalational devices, but no regional study was done in hilly areas of Uttarakhand. (8,11,12) This region is secluded, isolated and predominantly composed of the indigenous population that has lesser access to education, health care facilities and transport. The consulting physician has lesser time to interact with the patients and hence here the role of paramedical staff including pharmacist assumes a greater importance. (13-16) Even neighbours, friends or family members can impart repeated training in inhalational technique if properly instructed themselves by a medical person.

CONCLUSION:

With the increase in urbanization, there is an increase in industrial and automobile pollution. Biomass fuel exposure, smoking has also increased in recent times. These factors along with the increase in the average life span of individuals in developing nations have lead to an increase in Bronchial Asthma as well as COPD. Inhalational drugs are the mainstay of treatment in these conditions, hence correct training of patients regarding inhalational device is a must for long term control of disease.

This study has clearly shown the dismal performance of inhalational technique among the people of this region. It is high time now to properly spend time with the patient training him/ her regarding the proper use of inhalational devices. Large range awareness programmes should be conducted regarding proper inhalational technique, not only for educating patients but also prescribers, pharmacists, and other trainers as well.

REFERENCES

- Klijn SL, Hilgsmann M, Evers SMAA, Román-Rodríguez M, Van Der Molen T, Van Boven JFM. Effectiveness and success factors of educational inhaler technique interventions in asthma & COPD patients: a systematic review. 2017;27:24. Available from: www.nature.com/njppern
- Virchow JC, Crompton GK, Dal Negro R, Pedersen S, Magnan A, Seidenberg J, et al. Importance of inhaler devices in the management of airway disease. Vol. 102, Respiratory Medicine. 2008. p. 10-9.
- Redel HK, Boulet LP. Global Initiative for Asthma [Internet]. GINA; 2021. p. 1-215.

- Available from: <https://ginasthma.org/wp-content/uploads/2021/05/GINA-Main-Report-2021-V2-WMS.pdf>
4. Fink JB, Rubin BK. Problems with inhaler use: A call for improved clinician and patient education. In: *Respiratory Care* [Internet]. 2005 [cited 2021 May 21]. p. 1360–74. Available from: <http://www.asthma.ca/>
 5. Basheti IA, Reddel HK, Armour CL, Bosnic-Anticevich SZ. Improved asthma outcomes with a simple inhaler technique intervention by community pharmacists. Vol. 119, *Journal of Allergy and Clinical Immunology*. Mosby; 2007. p. 1537–8.
 6. GOLD. Global Initiative for Chronic Obstructive Lung Disease [Internet]. GOLD; 2021. p. 1–164. Available from: https://goldcopd.org/wp-content/uploads/2020/11/GOLD-REPORT-2021-v1.1-25Nov20_WMVF.pdf
 7. van der Palen J, Klein JJ, Kerkhoff AH, van Herwaarden CL, Seydel ER. Evaluation of the long-term effectiveness of three instruction modes for inhaling medicines. *Patient Educ Couns*. 1997 Dec;32(1 Suppl):S87-95.
 8. Ganguly A, Das A, Roy A, Adhikari A, Banerjee J, Sen S. Study of proper use of inhalational devices by bronchial asthma or cpod patients attending a tertiary care hospital. *J Clin Diagnostic Res*. 2014;8(10):HC04–7.
 9. Lindgren S, Bake B, Larsson S. Clinical consequences of inadequate inhalation technique in asthma therapy. *Eur J Respir Dis*. 1987 Feb;70(2):93–8.
 10. Newman SP, Weisz AWB, Talae N, Clarke SW. Improvement of drug delivery with a breath actuated pressurised aerosol for patients with poor inhaler technique. *Thorax* [Internet]. 1991 [cited 2021 May 25];46(10):712–6. Available from: <https://pubmed.ncbi.nlm.nih.gov/1750017/>
 11. Kamps AWA, Brand PLP, Roorda RJ. Determinants of correct inhalation technique in children attending a hospital-based asthma clinic. *Acta Paediatr Int J Paediatr*. 2002;91(2):159–63.
 12. Lötvall J. Inhalation therapy of the future - How will it change the way we treat asthma? [Internet]. Vol. 14, *Journal of Aerosol Medicine: Deposition, Clearance, and Effects in the Lung*. Mary Ann Liebert Inc.; 2001 [cited 2021 May 25]. Available from: <https://pubmed.ncbi.nlm.nih.gov/11424893/>
 13. McFadden ER. Improper patient techniques with metered dose inhalers: Clinical consequences and solutions to misuse. *J Allergy Clin Immunol* [Internet]. 1995 [cited 2021 May 25];96(2 SUPPL.):278–83. Available from: <https://pubmed.ncbi.nlm.nih.gov/7636071/>
 14. Reddel HK, Bosnic-Anticevich SZ, Armour CL, Basheti I. Pharmacist interventions in asthma. Vol. 32, *European Respiratory Journal*. 2008. p. 812.
 15. Mehuys E, Van Bortel L, De Bolle L, Van Tongelen I, Annemans L, Remon JP, et al. Effectiveness of pharmacist intervention for asthma control improvement. *Eur Respir J* [Internet]. 2008 Apr [cited 2021 May 25];31(4):790–9. Available from: <https://pubmed.ncbi.nlm.nih.gov/18094011/>
 16. García-Cárdenas V, Sabater-Hernández D, Kenny P, Martínez-Martínez F, Faus MJ, Benrimoj SI. Effect of a pharmacist intervention on asthma control. A cluster randomised trial. *Respir Med*. 2013 Sep;107(9):1346–55.