Content available at: https://www.ipinnovative.com/open-access-journals

IP Indian Journal of Immunology and Respiratory Medicine

Journal homepage: https://www.ijirm.org/

Original Research Article

A cross-sectional study on knowledge, attitude and practice about inhaler usage in chronic obstructive pulmonary disease and asthma patients

Niriksha Shivsharanappa Adky[1], Abhinandan S Kumbar[1]*, Basavaraj Sureshbabu Sangolli[1]

[1]Dept. of Respiratory Medicine, Basaveshwara Medical College & Hospital, Chitradurga, Karnataka, India

Abstract

Introduction: Drug inhalation is the treatment of choice for chronic obstructive pulmonarydisease (COPD) and Asthma patients and the maximum benefit depends on thecorrect use of inhaler devices. Majority of patients inhalation errors and suboptimalinhaler technique is associated with worsened health outcomes.

Aim and Objectives: 1. To assess the awareness of correct inhaler technique among COPD and bronchial asthma patients. 2. To estimate the proportion of COPD and bronchial asthma patients, who practice correct inhaler technique.

Materials and Methods: COPD and Asthma patients attending Basaveshwara hospital were included in the study. Patients were asked to demonstrate use of inhalers and assessed for inhalertechnique and necessary history noted. Data analysed using standard statistical methods.

Results and Discussion: 100 patients participated in the study and it was observed that 62% were males and 38% were females, 64% were COPD patients and 36% were Asthma patients, and 67% were using Dry powder inhaler (DPI), 12% were using Meter doseinhaler (MDI), 21% were using MDI with spacer, 43% followed a good technique and 57% demonstrated poor technique, and 40% were aware about the importancegood technique and 60% were unaware.

Conclusion: The study reveals a high prevalence of error in inhaler technique. The identification of factors associated with error could provide information to implement appropriateactions to reduce the rates of wrong technique and improve outcome.

Keywords: Inhaler Usage, Chronic Obstructive Pulmonary Disease (COPD), Asthma, Awareness

Received: 24-05-2025; **Accepted:** 20-06-2025; **Available Online**: 17-07-2025

1. Introduction

The updated GOLD 2025 and GINA 2025 guidelines identify poor inhaler technique and treatment access disparities as major contributors to the persistent symptom burden and quality of life impairment in COPD and asthma patients worldwide.[1,2] According to the Global Burden of Disease Study 2019, COPD affects around 174 million individuals globally, while asthma affects around 262 million people, with both conditions contributing significantly to years lived with disability (YLD).[3] The economic impact is equally staggering, with annual costs for COPD management exceeding $7 billion in India alone (2023).[4]

Inhalation therapy has been the cornerstone of pharmacological management for both COPD and asthma for decades, offering the advantage of direct drug delivery to the airways with minimal systemic side effects.[5] The Global Initiative for Chronic Obstructive Lung Disease (GOLD) and Global Initiative for Asthma (GINA) guidelines emphasize the critical role of proper inhaler technique in achieving optimal disease control.[1,2] However, numerous studies have demonstrated that incorrect inhaler use remains a pervasive problem, with error rates ranging from 46% to 90% across different device types.[6,7]

The complexity of modern inhaler devices, including pressurized metered-dose inhalers (pMDIs), dry powder inhalers (DPIs), and soft mist inhalers (SMIs), presents significant challenges for patients.[8] Common errors include failure to exhale fully before inhalation, incorrect mouthpiece positioning, inadequate breath-hold after inhalation, and

*Corresponding author: Abhinandan S Kumbar
Email: niriksha511@gmail.com

http://doi.org/10.18231/j.ijirm.2025.013

improper device preparation.[9] These technical errors have been directly linked to poor disease control, increased exacerbation frequency, and higher healthcare utilization.[10,11] The 'patient-related factors' further compound these challenges. Studies have identified several barriers to proper inhaler use, including limited health literacy and understanding of disease pathophysiology,[12] negative attitudes toward chronic medication use,[13] physical limitations (particularly in elderly COPD patients),[14] and socioeconomic factors affecting access to care and education.[15]

The knowledge, attitude and practice (KAP) model provides a comprehensive framework for assessing these multidimensional challenges in respiratory disease management.[16] While previous research has examined individual components of inhaler use, there remains a need for integrated assessments that evaluate the interplay between patients' understanding, beliefs, and actual practices.[17] This is particularly relevant in low- and middle-income countries, where resource limitations often restrict access to proper inhaler training.[18]

Healthcare system factors also play a crucial role. Time constraints during clinical encounters, inadequate provider knowledge about different inhaler devices, and lack of standardized training protocols have all been identified as systemic barriers to optimal inhaler use.[19,20] Furthermore, the COVID-19 pandemic has exacerbated these challenges by reducing face-to-face patient education opportunities and increasing reliance on telemedicine for chronic disease management.[21]

This cross-sectional study aims to comprehensively evaluate the awareness and practice of correct inhaler technique among COPD and asthma patients in central Karnataka.

2. Aim and Objectives

1. To assess the awareness of correct inhaler technique among COPD and bronchial asthma patients.
2. To estimate the proportion of COPD and bronchial asthma patients, who practice correct inhaler technique.

3. Materials and Methods

After obtaining Institutional Ethics Committee clearance, this cross-sectional study was conducted at the Department of Respiratory Medicine, Basaveshwara Medical College Hospital, from January to June 2024. One hundred patients who were diagnosed cases of chronic obstructive pulmonary disease or asthma, attending the out-patient facility of Department of Respiratory Medicine were included in the study after explaining the purpose of the study and obtaining their informed consent.

Patients' data was collected in a predesigned semi-structured proforma. The socio-demographic details and clinical history, diagnosis and treatment of the patients were noted in the proforma by the investigator by interview technique. The type of inhaler used by the patients was noted.

Followed by this, patients' awareness about correct technique of inhaler usage was elicited by the clinician. Further, patients were asked to demonstrate the technique/ method in which they use the inhaler. Correct technique was ascertained as per the American Lung Association Guidelines.[22]

Data was compiled in Microsoft excel and analysed using Statistical Package for the Social Sciences version 20 (SPSS Inc., SPSS for Windows, Chicago, USA). Qualitative variables are presented as frequencies and percentages. Quantitative variables are presented as mean, standard deviation. Chi square test was applied to find the significance of association between qualitative variables. Associations with p value of < 0.05 were considered to be statistically significant.

3.1. Dry powder inhaler technique

1. Remove the cap. For single use devices, load a capsule into the device as directed.
2. Breathe out slowly and completely (not into the mouthpiece).
3. Place the mouthpiece between the front teeth and seal the lips around it.
4. Breathe in through the mouth quickly and deeply over two to three seconds.
5. Remove the inhaler from the mouth. Hold your breath for as long as possible (4 to 10 seconds).
6. Breathe out slowly.
7. Replace the cap or slide the cover over the mouthpiece.
8. For DPIs that use capsules, you should repeat the inhalation to ensure that the full dose has been inhaled.
9. A score of 6-8 indicates good technique and 1-5 indicates poor DPI technique

3.2. Meter dose inhaler technique

1. Shake the canister.
2. Hold the canister upright at opening of mouth.
3. Begin a slow breath.
4. Actuate the MDI once while continuing with a slow breath.
5. Inhale to total lung capacity.
6. Hold breath for at least 4 seconds.
7. A score of 5-6 indicates good technique and 1-4 indicates poor MDI

3.3. MDI with spacer

1. Remove the cap of the spacer.

2. Remove the cap of the puffer. Shake the puffer 5 or 6 times.
3. Insert the puffer in the hole at the back of the spacer
4. Blow all your breath out until lungs are empty.
5. Insert the spacer mouthpiece into the mouth.
6. Press the down once on the puffer's canister.
7. Slowly breathe in from the spacer full breath.
8. Hold your breath for at least 4 seconds.
9. A score of 6-8 indicates good technique and 1-5 indicates poor MDI with spacer technique

4. Results

The present study included 100 patients with chronic respiratory conditions such as asthma or COPD. 64% were COPD patients and 36% were suffering from bronchial asthma. (**Figure 1**) Majority of the study population were males (62%). A 52% patients were aged above 60 years. Illiteracy rate was found to be high (37%), whereas 41% patients had studied upto secondary school. (**Table 1**) 49% of patients reported using smoke-producing tobacco products. Biomass fuel smoke exposure during daily activities was reported by 15% of patients. (**Table 2**)

Table 1: Socio-demographic characteristics of study participants

Variables	Percentage (%)
Gender	
Male	62
Female	38
Age	
Up-to 40 years	13
41-50	9
51-60	26
>60 yrs	52
Average age in years	58.9±13.5 years
Place of residence	
Rural	59
Urban	41
Education Status	
Illiterate	37
Up-to primary	15
Up-to secondary	26
PUC / Diploma / Graduate	22
Occupation	
Home-maker	23
Farmer	59
Others	18

For the treatment of COPD and asthma, it was observed that 67% of patients were using dry powder inhalers (DPIs), 12% were on metered dose inhalers (MDIs), and the remaining 21% used MDIs with spacers. Overall, correct inhaler technique was demonstrated by 43% of patients, while 57% had suboptimal technique. Device-specific analysis showed that 46.3% of DPI users and 52.4% of MDI-with-spacer users exhibited good inhaler technique. In contrast, the majority of MDI-only users had poor technique (91.7%). (**Table 3**)

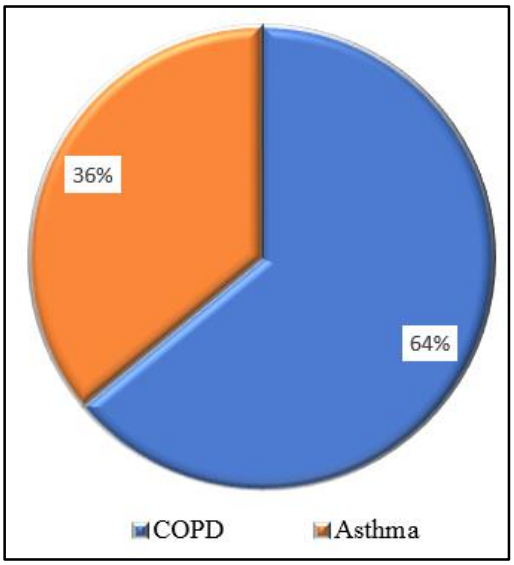

Figure 1: Distribution of respiratory illness among the study participants

Table 2: Distribution of study participants according to exposure to biomass fuel and tobacco consumption habits

Variables	Percentage (%)
Persons who have Biomass Fuel Exposure	15
Persons who are Cigarette/ Beedi Smokers	49
Persons who Consume chewable forms of Tobacco	02
Persons with no tobacco consumption habits and no biomass fuel exposure	34
Total	100

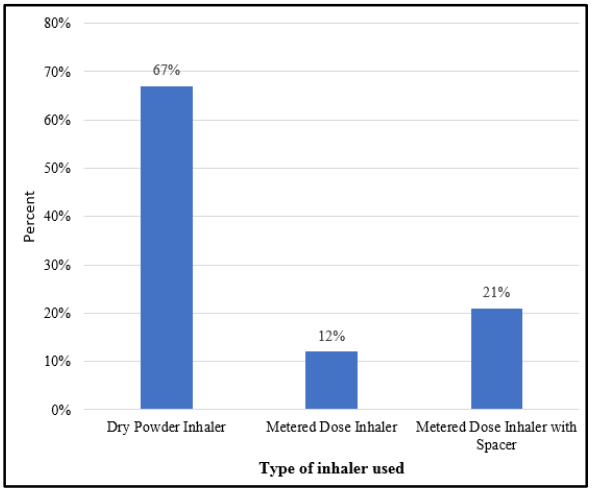

Figure 2: Type of inhaler used by the study participants

Table 3: Awareness and practice of correct inhaler technique

Variables	Characteristics	Type of Inhaler used by the study patients			Total
		DPI (n=67)	MDI (n=12)	MDI with spacer (N=21)	
Awareness about correct inhaler technique	Present	29 (43.3%)	02 (16.7%)	08 (38.1%)	39(39%)
	Absent	38 (56.7%)	10 (83.3%)	13 (61.9%)	61(61%)
Inhaler Technique	Correct	31 (46.3%)	01(8.3%)	11 (52.4%)	43(43%)
	Incorrect	36 (53.7%)	11 (91.7%)	10 (47.6%)	57(57%)
Total		67 (100%)	12 (100%)	21 (100%)	100 (100%)

5. Discussion

Our cross-sectional study provides significant insights into inhaler usage patterns among COPD and asthma patients, revealing several key findings with important clinical implications. The demographic profile of our study showed male COPD predominance (62%), consistent with global COPD epidemiology where smoking prevalence is higher among males.[1] The high proportion of elderly patients (51% above 60 years) aligns with the chronic progressive nature of these respiratory conditions.[23] (**Table 1**)

The education profile revealed that 72% of patients had either no formal education (37%) or education below class 10 (41%), which correlates strongly with our finding that 57% demonstrated poor inhaler technique. (**Table 1**) This association between low education levels and improper inhaler use has been well-documented in previous studies,[10,12] highlighting the need for simplified patient education strategies.

The 49% smoking prevalence among patients, particularly concerning in a population already diagnosed with chronic respiratory diseases, suggests inadequate smoking cessation counseling.[25] This finding warrants the integration of tobacco cessation programs with inhaler education initiatives. (**Table 2**)

The device distribution showed DPI dominance (67%), likely due to their relative ease of use compared to MDIs.[8] However, our finding that only 46.3% of DPI users had good technique contradicts the common assumption that DPIs are inherently easier to use correctly. This suggests that even "user-friendly" devices require proper training.[7]

The alarmingly suboptimal inhale usage technique among MDI users (majority with poor technique) and modest performance with spacers (only 52.4% good technique) reinforces existing literature about the challenges of coordinating actuation with inhalation.[9] (**Table 3**) These results emphasize that device selection should be individualized based on patient assessment rather than general assumptions.[24]

The study by Dhadge et al. (2020) highlights important discrepancies in inhaler technique performance between home and clinical settings. Using a smartphone video application to monitor inhaler use at home, the researchers found that patients often demonstrated correct technique in the clinic but made errors when using their inhalers at home. This suggests that performance in a controlled clinical environment does not necessarily translate to real-world adherence and correct usage.[25-26]

A 2022 study by Nitya and colleagues found that while 89% of asthma/COPD patients achieved proper inhaler technique after brief training, critical errors like inadequate breath-holding (31%) and poor coordination in elderly patients (19%) persisted, highlighting the need for repeated assessments.[27]

While Siddharth A et al. (2024) reported 2.8-fold increases in proper MDI use after counseling, their findings emphasize the need for repeated training, as 18% of patients reverted to errors within 4 weeks of initial instruction.[28]

6. Conclusion

This cross-sectional study highlights significant deficiencies in inhaler technique among COPD and asthma patients, with poorer performance noted in elderly and less-educated groups. Despite wide availability of inhaler devices, only 43% of patients demonstrated correct usage, highlighting the need for improved training. Device-specific challenges, particularly with MDIs and DPIs, emphasize the importance of patient-centered device selection and robust, repeated training using teach-back methods. The strong link between low education and improper technique identifies a vulnerable population requiring tailored educational interventions. Additionally, the high prevalence of smoking among these patients signals a need for integrated tobacco cessation with respiratory care.

It is essential to develop targeted educational interventions identifying specific knowledge gaps, misconceptions, and practical barriers, so as to improve inhaler technique and ultimately enhance better disease outcomes. Proper inhaler technique is essential for effective COPD and asthma management and must be prioritized alongside pharmacotherapy.

7. Source of Funding

None.

8. Conflict of Interest

None.

References

1. Global Initiative for Chronic Obstructive Lung Disease (GOLD). Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease (2025 report). [Cited 2025 March 9] https://goldcopd.org/2025-gold-report/
2. Global Initiative for Asthma (GINA). Global strategy for asthma management and prevention (2025 update) [Cited 2025 March 9], https://ginasthma.org/2025-gina-strategy-report/
3. GBD 2019 Diseases and Injuries Collaborators. Global burden of 369 diseases and injuries in 204 countries and territories, 1990-2019: a systematic analysis for the Global Burden of Disease Study 2019. *Lancet*. 2020;396(10258):1204–22.
4. Doke PP. Chronic respiratory diseases: a rapidly emerging public health menace. K. N. Rao Memorial Oration. *Indian J Public Health*. 2023;67(2):97–9.
5. Dolovich MB, Ahrens RC, Hess DR, Anderson P, Dhand R, Rau JL, et al. Device selection and outcomes of aerosol therapy: Evidence-based guidelines: American College of Chest Physicians/American College of Asthma, Allergy, and Immunology. *Chest*. 2005;127(1):335–71.
6. Sanchis J, Gich I, Pedersen S. Systematic review of errors in inhaler use: Has patient technique improved over time? *Chest.* 2016;150(2):394-406.
7. Melani AS, Bonavia M, Cilenti V, Cinti C, Lodi M, Martucci P, et al. Inhaler mishandling remains common in real life and is associated with reduced disease control. *Respir Med*. 2011;105(6):930–8.
8. 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. *Respir Med*. 2008;102(4):593–604.
9. Price DB, Román-Rodríguez M, McQueen RB, Bosnic-Anticevich S, Carter V, Gruffydd-Jones K, et al. Inhaler errors in the CRITIKAL study: Type, frequency, and association with asthma outcomes. *J Allergy Clin Immunol Pract*. 2017;5(4):1071–81.
10. Al-Jahdali H, Ahmed A, Al-Harbi A, Khan M, Baharoon S, Salih SB, et al. Improper inhaler technique is associated with poor asthma control and frequent emergency department visits. *Allergy Asthma Clin Immunol*. 2013;9(1):8.
11. Sulaiman I, Seheult J, MacHale E, Holmes MS, Hughes C, Sulaiman I, et al. A method to assess adherence in inhaler use through analysis of acoustic recordings of inhaler events. *PLoS One*. 2018;13(3):e0194627.
12. Press VG, Arora VM, Shah LM, Lewis SL, Ivy K, Charbeneau J, et al. Misuse of respiratory inhalers in hospitalized patients with asthma or COPD. *J Gen Intern Med*. 2011;26(6):635-42.
13. Hodder R, Price D. Patient preferences for inhaler devices in chronic obstructive pulmonary disease: experience with Respimat Soft Mist inhaler. *Int J Chron Obstruct Pulmon Dis*. 2009;4:381–90.
14. Allen SC, Jain M, Ragab S, Malik N. Acquisition and short-term retention of inhaler techniques require intact executive function in elderly subjects. *Age Ageing*. 2003;32(3):299–302.
15. Apter AJ, Wan F, Reisine S, et al. The association of health literacy with adherence and outcomes in moderate-severe asthma. *J Allergy Clin Immunol*. 2013;132(2):321–7.
16. Basheti IA, Reddel HK, Armour CL, Bosnic-Anticevich SZ. Counseling about Turbuhaler technique: needs assessment and effective strategies for community pharmacists. *Respir Care*. 2007;52(6):677–84.
17. Kritikos V, Price D, Papi A, Bender B, Rand C, Bogen DK, et al. A multinational observational study identifying primary care patients at risk of overestimation of asthma control. *NPJ Prim Care Respir Med*. 2019;29(1):43.
18. Mehuys E, Van Bortel L, De Bolle L, Tongelen IV, Annemans L, Remon JP, et al. Effectiveness of pharmacist intervention for asthma control improvement. *Eur Respir J*. 2008;31(4):790-9.
19. Hanania NA, Wittman R, Kesten S, Chapman KR. Medical personnel's knowledge of and ability to use inhaling devices. Metered-dose inhalers, spacing chambers, and breath-actuated dry powder inhalers. *Chest*. 1994;105(1):111–6.
20. Plaza V, Giner J, Rodrigo GJ, Dolovich MB, Sanchis J. Physicians' knowledge of inhaler devices and inhalation techniques remains poor in Spain. *J Aerosol Med Pulm Drug Deliv*. 2018;31(6):375–81.
21. Shah SA, Quint JK, Sheikh A. Impact of COVID-19 pandemic on asthma exacerbations: Retrospective cohort study of over 500,000 patients in a national English primary care database. *Lancet Reg Health Eur*. 2022;19:100428.
22. American Lung Association. COPD treatment and management. 2023. [Cited 2025 March 9], https://www.lung.org/lung-health-diseases/lung-disease-lookup/copd/treating
23. Singh D, Agusti A, Anzueto A, Barnes PJ, Bourbeau J, Celli BR, et al. Global strategy for the diagnosis, management, and prevention of chronic obstructive pulmonary disease: the GOLD science committee report 2019. *Eur Respir J*. 2019;53(5):1900164.
24. Usmani OS, Lavorini F, Marshall J, Dunlop WCN, Heron L, Farrington E, et al. Critical inhaler errors in asthma and COPD: a systematic review of impact on health outcomes. *Respir Res*. 2018;19(1):10.
25. Tønnesen P, Carrozzi L, Fagerström KO, Gratziou C, Jimenez-Ruiz C, Nardini S, et al. Smoking cessation in patients with respiratory diseases: a high priority, integral component of therapy. *Eur Respir J*. 2007;29(2):390–417.
26. Dhadge N, Shevade M, Kale N, Narke G, Pathak D, Barne M, et al. Monitoring of inhaler use at home with a smartphone video application in a pilot study. *NPJ Prim Care Respir Med*. 2020;30(1):46.
27. Nitya S, Kiruthika S, Meenakshi R, Suriya H, Yuvarajan S. A cross-sectional study of pre- and posttraining evaluation of inhaler use technique among outpatients with bronchial asthma or chronic obstructive pulmonary disease at a tertiary care hospital in India. *Perspect Clin Res*. 2022;13(4):184-8.
28. Siddharth A, Haward R, Chakraborty A. Evaluation of the Metered Dose Inhaler Technique: Initial Assessment and Post-counseling Improvements Among the Indian Population. *Cureus*. 2024;16(4):e57397.

Cite this article: Adky NS, Kumbar AS, Sangolli BS. A cross-sectional study on knowledge, attitude and practice about inhaler usage in chronic obstructive pulmonary disease and asthma patients. *IP Indian J Immunol Respir Med*. 2025;10(2):73-77.