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Patient Adherence and Device Preference in Inhalational Therapy Among COPD and Asthma Patients: A Cross-Sectional Study from a Tertiary Care Centre

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ABSTRACT

Background: Chronic Obstructive Pulmonary Disease (COPD) is condition that can easily exacerbate if compliance and adherence to therapy are low. Successful management of COPD and asthma depends greatly on patients following inhalational therapy regimens and using prescribed devices correctly. Nevertheless, problems such as non-adherence, improper technique, and unsuitable device substitution frequently undermine treatment effectiveness.
Aim: The objectives of this study were to determine adherence of patients to prescribed therapy and to identify reasons and possible causes of low compliance to therapy.
Material and method: This Cross-sectional analytical study was conducted on OPD and IPD patients of COPD and asthma. Through the use of a pre-validated questionnaire, demographic details, current therapy and responses about adherence and therapeutic preference were collected.
Result: Out of 90 patients enrolled 77.8% demonstrated good adherence to inhalational therapy. The mean number of acute exacerbations experienced annually after starting therapy was 2.9 ± 1.4 attacks. A further 27.8% of non-adherent patients indicated that the timing of the medication during the day posed a challenge. Device preference was influenced by ease of use, availability, and prior instruction. 72.2% patients preferred MDI + Spacer, while 27.8% patients preferred DPI. Poor adherence was significantly associated with increased frequency of exacerbations ($p < 0.05$).
Conclusion: Non-adherence and improper use of inhalational therapy remain major challenges. Patient education, standardized prescribing practices, and pharmacist training are essential to improve adherence and therapeutic outcomes. Personalized device selection based on patient capability and preference may further enhance treatment compliance.

Keywords: COPD, asthma, adherence, inhaler devices, device preference, inhalational therapy, exacerbation.

INTRODUCTION

Asian Chronic Obstructive Pulmonary Disorders (COPD) are common and emerging conditions, especially in South countries like India and China. The global incidence is reported to be around 10.3% of people aged 40 years or more; [1, 2] its

prevalence in India is estimated to be 7.4%.[3]

COPD is a condition that requires long-term therapy and consistent compliance on the patient's part to prevent repeated attacks or exacerbation of the present condition. More often than not, standardization of treatment with use of a common therapeutic modality for different groups of patients can create problems in drug use, which can affect patient compliance and adherence negatively.

Adhering to inhaled medications is crucial in the management of patients with COPD in both clinical and ambulatory settings. These pharmacologic agents include bronchodilators and corticosteroids used in a variety of aerosol devices that include small volume nebulizers (SVNs), pressurized metered-dose inhalers (pMDIs), and dry powder inhalers (DPIs)

Extensive literature reviews and meta-analyses have shown that COPD is a condition that can easily worsen if compliance and adherence to therapy are low. Patients often stop using a medication after receiving it from the doctor, especially when they feel better or encounter problems in usage or adverse effects that may or may not have been explained to them earlier. Oral therapy is known to produce systemic effects, which is why it is less preferred. However, inhalational therapy can also cause technical difficulties and adverse reactions that may reduce a patient's adherence. Additionally, the cost factor can also influence compliance with therapy. [4-6]

Several studies have reported that an average of 60% of patients with COPD do not adhere to prescribed therapy and that up to 85% of patients use their inhaler ineffectively

Although preference and compliance studies have been extensively conducted in various parts of the world, very few have been conducted in India, with little exploration into the possible cause of reduced adherence to a particular modality of therapy.

MATERIALS & METHODS

Study Design and Setting

The cross-sectional study was initiated following approval from the Institutional Ethics Committee (SKNMC/Ethics/App/ 2022/858) from 2022-2023. Informed consent was obtained from all participants

Study Participants

This Cross-sectional was conducted among both inpatients and outpatients in the Department of Respiratory Medicine. Patients diagnosed with COPD and asthma using any inhalational device for more than 45 days were included. Patients having coexisting pulmonary comorbidities (e.g., tuberculosis, malignancy, metastasis, interstitial lung disease, pneumonia, pneumoconiosis), having known or diagnosed cardiac conditions, Patients with cognitive impairment, psychiatric disease or unwilling to participate were excluded.

Data Collection Tool and Procedure

Data were collected using a pre-validated semi-structured questionnaire developed after an extensive literature review and expert input. The questionnaire was included in the case report form (CRF) and comprised the following domains:

- Demographic and clinical profile: Age, gender, weight, height, BMI, socioeconomic status, diagnosis and duration of illness, history of smoking and seasonal exacerbations
- Therapy-related details: Type of drugs or combinations used, mode of therapy (oral/inhalational), type of device (DPI, MDI, MDI + spacer), frequency and duration of usage, number of exacerbations post-therapy initiation
- Adherence and preference assessment: Self-reported adherence behavior categorized into four levels (fully adherent to always non-adherent), reasons for non-adherence, patient-rated ease of use, availability, affordability, device maintenance, training on technique, adverse effects, and preference for switching

Interviews were conducted in the local language (Marathi/Hindi/English) by trained investigators, ensuring consistency in data capture. Each interview lasted approximately 15–20 minutes.

Statistical Analysis

Descriptive statistics were used to summarize demographic and clinical characteristics. Categorical variables were expressed as frequencies and percentages, while continuous variables were expressed as mean ± standard deviation (SD). Associations between adherence levels and categorical variables (e.g., type of device, availability, affordability) were evaluated using Chi-square test. Continuous variables were compared using one-way ANOVA test. Pearson correlation coefficient was calculated to evaluate the relationship between duration of therapy and percentage symptom relief. A p-value of <0.05 was considered statistically significant. All analyses were conducted using SPSS version XX (IBM Corp., Armonk, NY).

RESULT

A total of 90 patients diagnosed with asthma or chronic obstructive pulmonary disease (COPD) were enrolled in the study. The mean age of the participants was 61.9 ± 6.2 years, and the average duration of respiratory illness was 7.8 ± 3.3 years (Table 1). The mean duration of inhalational therapy based on mode of delivery was 3.8 ± 2.1 years for DPI, 6.0 ± 3.9 years for MDI + Spacer and 1.4 ± 0.0 years for Oral + DPI.

Table 1: Demographic and clinical characteristics of COPD and asthma patients receiving inhalational therapy

Parameter	Result
Mean Age	61.9 ± 6.2 years
Mean Duration of Disease	7.8 ± 3.3 years
Mean Duration of Inhalational Therapy (by mode)	DPI: 3.78± 2.1 yrs MDI + Spacer: 6.0 ± 3.9 yrs ORAL+DPI: 1.4 ± 0.0 yrs

Distribution of Acute Attacks After Therapy

Following the initiation of inhalational therapy, patients exhibited varying frequencies of acute exacerbations over the course of a year. While a subset of patients responded well to treatment, a notable proportion continued to experience recurrent attacks. The mean number of acute exacerbations experienced annually after starting therapy was 2.9 ± 1.4 attacks. Specifically, 22.2% of patients reported having only one acute attack per year, reflecting relatively good disease control. An additional 16.7% experienced two exacerbations, and 22.2% had three attacks annually, indicating a moderate frequency of flare-ups despite ongoing therapy. However, a substantial 38.9% of patients suffered from more than three acute attacks per year, suggesting either suboptimal response to treatment, poor adherence, or potentially more severe baseline disease. This subgroup represents a clinically significant population requiring closer monitoring and potentially revised therapeutic strategies. These findings underscore the heterogeneity in therapeutic response and highlight the need for individualized management plans, particularly for those with persistent exacerbations despite regular inhalation therapy.

Adherence to Therapy

Out of 90 patients, 70 (77.8%) patients reported taking therapy as prescribed, indicating satisfactory adherence. The remaining 20 (22.2%) patients were non-adherent to varying degrees. Among the 20 patients who reported not adhering consistently to their prescribed inhalational therapy, several underlying reasons for non-compliance were identified. The most

frequently cited factor was the frequency of dosing, which affected nearly 44.4% of the non-adherent patients (Figure 1). These individuals found it difficult to remember or manage the multiple daily doses, suggesting that simpler regimens may improve adherence.

A further 27.8% of non-adherent patients indicated that the timing of the medication during the day posed a challenge. This typically involved difficulties aligning therapy with daily routines, work schedules, or fasting periods, leading to missed or delayed doses. Another 16.7% of the patients found the method of using the device to be complicated, particularly with respect to the correct technique required for inhalation. These individuals reported that despite being trained, they found it difficult to maintain consistent technique, which affected their motivation to use the device as prescribed. Lastly, 11.1% of the non-adherent patients described a sense of social discomfort when using their inhalers, particularly in public settings. This embarrassment or self-consciousness resulted in skipped doses or avoidance of therapy during the day. These findings indicate that both practical issues (such as frequency and complexity of use) and psychosocial factors (like public use anxiety) contribute to non-compliance, underscoring the need for tailored patient education, device selection, and behavioral support.

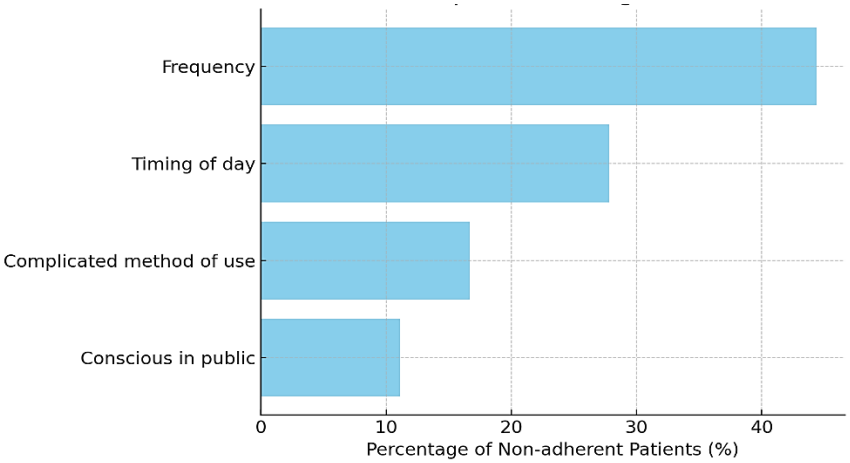

Figure 1: Distribution of reported reasons for non-compliance among non-adherent COPD and asthma patients.

Device Availability, Maintenance, and Affordability

In terms of availability, nearly half of the study participants (47.1%) reported that their prescribed inhalational devices were always available at local pharmacies. A significant proportion (35.3%) indicated that the devices were sometimes available, highlighting intermittent access issues. A smaller subset (17.6%) noted that their devices were often available, suggesting that while availability was generally acceptable for most patients, inconsistencies still existed in procurement across certain settings.

With regard to the maintenance of inhalational devices, a vast majority of patients (83.3%) found them always easy to maintain, indicating high levels of user-friendliness and minimal operational complexity. An additional 11.1% reported that the devices were often easy to maintain, while 5.6% experienced occasional difficulties, describing the maintenance process as only sometimes easy.

Affordability of inhalation therapy emerged as a concern among the cohort. Although 17.6% of patients considered their devices to be always affordable, and 11.8% rated them as often affordable, the majority (70.6%) indicated that the devices were only

sometimes affordable. This suggests that cost may represent a periodic barrier to sustained adherence, particularly in lower-income segments of the patient population.

Relief from Therapy

The mean rate of symptom relief reported by patients was 68.1 ± 16.3%. Only 11.1% of patients experienced >75% relief, and another 11.1% reported complete relief (100%). The average time to symptom relief was 2.0 ± 0.6 days.

Preferred Mode of Therapy

When asked about their preferred method of therapy, 72.2% patients preferred MDI + Spacer, while 27.8% patients preferred DPI. The majority's preference for MDI + Spacer corresponds with their higher adherence and comfort levels.

Inferential Statistical Analysis

To assess the associations between various factors influencing patient adherence and therapeutic outcomes, appropriate inferential statistical tests were conducted (Table 2). Tests revealed a statistically significant association between the mode of therapy and patient adherence to prescribed inhalational therapy ($p = 0.0002$). Patients using MDI with spacer were significantly more adherent compared to those using DPI or oral+DPI combinations, suggesting that device selection plays a critical role in fostering compliance.

Further analysis demonstrated a highly significant association between ease of device use and adherence ($p < 0.0001$). Patients who found their inhalational device "always easy to use" had markedly better adherence than those who found it difficult or only sometimes manageable. This finding reinforces the importance of patient comfort and familiarity with the device in ensuring consistent use. The availability of inhalers was also significantly linked to adherence ($p = 0.0141$). Those who reported consistent device availability in local pharmacies were more likely to adhere to therapy, highlighting the practical barrier that availability imposes on long-term disease control.

An analysis of variance (ANOVA) indicated a significant difference in the mean number of acute exacerbations among patients using different therapy modes ($p = 0.0001$). Notably, patients on MDI + Spacer experienced fewer attacks compared to other groups, suggesting superior clinical effectiveness when proper inhalation technique and drug delivery are ensured.

Contrary to expectations, no significant correlation was found between the duration of inhalational therapy and the percentage of relief experienced by patients (Pearson correlation coefficient = -0.02, $p = 0.8374$). This implies that length of therapy alone does not predict the degree of symptomatic improvement, and that other factors like adherence and technique likely play more important roles. A highly significant association was observed between dosing frequency and adherence ($p < 0.0001$). Patients using therapy once daily were more adherent compared to those using it twice daily or more frequently. This underscores the influence of regimen simplicity on patient behavior. Lastly, affordability was shown to have a profound effect on adherence, with a p-value < 0.0001. Patients who found their inhalers consistently affordable demonstrated significantly better compliance compared to those who faced cost-related barriers.

Taken together, these results strongly indicate that device selection, ease of use, dosing frequency, affordability, and availability are pivotal determinants of both adherence and clinical outcomes in patients with asthma and COPD. These findings support a more personalized and patient-centric approach to inhalation therapy to maximize therapeutic benefit.

Table 2: Inferential statistical analysis of associations between adherence, clinical outcomes, and influencing factors among COPD and asthma patients on inhalational therapy.

Comparison	Statistical Test	p-value	Interpretation
Adherence vs Mode of Therapy	Chi-square	0.0002	Statistically significant — Mode of therapy impacts adherence.
Adherence vs Ease of Use	Chi-square	0.0000	Highly significant — Device ease-of-use influences adherence.
Adherence vs Device Availability	Chi-square	0.0141	Significant — Availability correlates with adherence.
Acute Attacks vs Mode of Therapy	ANOVA	0.0001	Significant — Number of attacks varies by therapy type.
Duration of Therapy vs Relief	Pearson correlation	$\rho = -0.02$; $p = 0.8374$	Not significant — No correlation between duration and relief.
Adherence vs Frequency of Use	Chi-square	0.0000	Highly significant — Higher dosing frequency reduces adherence.
Adherence vs Affordability	Chi-square	0.0000	Highly significant — Cost affects patient adherence.

These results suggest that ease of use, dosing frequency, affordability, and mode of therapy significantly influence patient adherence. Also, the mode of therapy impacts frequency of acute attacks, though duration of therapy does not correlate with relief.

DISCUSSION

This cross-sectional study explored real-world adherence patterns and patient preferences related to inhalational therapy in individuals with asthma and COPD. The results demonstrate that while a majority of patients reported adherence to prescribed therapy, factors such as dosing frequency, device complexity, affordability, and availability played significant roles in influencing compliance and treatment outcomes.

In the present study, 77.8% of patients reported adherence to their prescribed inhalational regimen. While this is encouraging, other studies suggest that objective adherence rates are often much lower. For instance, a global analysis revealed that non-adherence rates in COPD can exceed 50%, especially when adherence is assessed using pharmacy refill data or electronic monitoring.[7] Similarly, Turégano-Yedro et al. (2023) highlighted the discrepancy between self-reported and actual adherence, noting that non-adherence often goes unrecognized by clinicians.[8]

We found that frequency of dosing was the leading cause of non-compliance, affecting 44.4% of non-adherent patients. This aligns with prior findings indicating that complex or multiple-dose regimens are associated with significantly lower adherence.[9] A study by Dijk et al. (2023) also confirmed that patients using multiple inhaler devices were more likely to experience dosing confusion and reduced treatment satisfaction.[10] Furthermore, timing-related challenges and device complexity were cited by 27.8% and 16.7% of patients, respectively. These concerns echo the conclusions of Halpin et al. [11] who reported that critical inhaler technique errors, including incorrect timing of inhalation and coordination, are prevalent across all patient groups and strongly associated with poor disease control. On the contrary, if the patient had been prescribed a long-acting single-dose regimen, missing a dose would result in a longer drug-free interval and recurrence

Nearly half of our patients indicated that their prescribed inhalers were not always available at local pharmacies, while 70.6% reported them to be only sometimes affordable. The inhaler was dispensed based on availability rather than therapeutic content, without confirming the pharmacologic class Due to reliance on locally available devices, there is a possibility of inappropriate interchange between LAMA, LABA, and SABA

inhalers. This poses a significant risk of disease recurrence or exacerbation resulting from inconsistent pharmacologic management Similar constraints have been highlighted in global and regional studies, especially from low- and middle-income countries. Tabyshova et al. identified economic barriers and inconsistent availability of inhalers as major contributors to poor adherence in Central Asia.[12] Likewise, O'Toole et al. emphasized that out-of-pocket costs and insurance limitations are often the most impactful factors affecting inhaler use in chronic respiratory diseases.[13]

A high percentage of our participants (83.3%) found their inhalers easy to maintain, reflecting a favourable perception of device usability. Nevertheless, real-world studies continue to report widespread inhaler misuse. A meta-analysis by Chrystyn et al. (2017) found that up to 90% of asthma and COPD patients commit at least one critical inhaler error, often despite initial device training.[14] These errors are strongly correlated with increased exacerbation risk and healthcare utilization.[11]

Despite adherence, 38.9% of patients reported experiencing more than three exacerbations per year. This suggests that adherence alone is insufficient to prevent disease progression or acute attacks. In a systematic review by Vauterin et al. (2024), poor inhaler technique and device mismatch were identified as independent predictor of frequent exacerbations, even among adherent patients.[15] Exacerbations may also result from poor adherence or improper use of inhalers. Some patients administer their medication solely during acute attacks, neglecting the recommended maintenance therapy, thereby compromising disease control.

Our inferential analysis revealed statistically significant associations between adherence and several factors: mode of therapy, device ease of use, availability, dosing frequency, and affordability. These findings are consistent with previous work by Monteiro et al. who proposed a multidimensional model of adherence behavior that incorporates both patient-related and system-level factors.[7]

No significant correlation was observed between duration of therapy and symptom relief, a finding echoed in the work of Jardim et al. (2019), who emphasized that long-term therapy must be supported by proper technique and ongoing reassessment of inhaler choice to yield clinical benefits.[16]

Study Limitations

This study has few limitations that should be considered while interpreting the findings. Adherence to inhalational therapy was assessed through patient self-reporting, which is susceptible to social desirability and recall bias. Objective measures such as electronic monitoring devices or pharmacy refill records were not used, which may lead to overestimation of adherence rates. Secondly, the study was conducted at a single tertiary care teaching hospital, limiting the generalizability of results to other geographic regions, healthcare settings, or socioeconomic strata. The study design does not allow for establishing causality between the identified factors and adherence or clinical outcomes. Longitudinal studies would be necessary to explore the long-term impact of these variables on disease control. Lack of detailed comorbidity analysis: The impact of co-existing conditions (e.g., cardiovascular disease, diabetes, anxiety) on adherence and preference was not explored in this study, which may be important modifiers of patient behavior.

CONCLUSION

This study highlights the complex interplay between device characteristics, patient behavior, and clinical outcomes in the management of asthma and COPD. Our findings reinforce the importance of simplifying inhalation regimens, ensuring device affordability and availability, and tailoring choices based on patient

preferences and capabilities. To optimize treatment success, adherence strategies must be multidimensional, integrating clinical education, patient counselling, and system-level support.

Declaration by Authors

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