Original Article

Patient Satisfaction and Preference for Metered-Dose Inhalers vs. Dry Powder Inhalers in the Treatment of Obstructive Airway Disease

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ABSTRACT

OBJECTIVE: To evaluate patient preference for different inhaler devices in the treatment of obstructive airway disease (OAD).

METHODOLOGY: This cross-sectional study was conducted at the Department of Pulmonology, Indus Hospital, Korangi Campus, Karachi, Pakistan, from July 2023 to January 2024. A non-probability, consecutive sampling technique was adopted. The inclusion criteria were patients aged 18-70 years presenting with OADs, regardless of disease duration, and using either a metered dose inhaler (MDI) or a dry powder inhaler (DPI). Patients who were using pressured MDI (pMDI) were given DPI containing the same drugs at the exact dosage for two weeks. Patients who were using DPI were given pMDI containing the same medications at the precise dosage for two weeks. Patients were trained on the techniques for using the inhalers, and the patient preference between two inhaler devices was determined using the PASAPQ questionnaire. Data analysis was performed using SPSS 26.0.

RESULTS: In a total of 100 patients, the mean age was 51.64±13.52 years. There were 59 (59.0%) male patients. Forty-nine percent of patients had COPD, whereas asthma was present in 51 (51.0%). Out of 100 patients, 50 (50%) were using MDI inhalers, and 50 (50%) were using DPI inhalers. The mean PASAPQ scores were significantly higher in terms of satisfaction (p = 0.0002), performance (p = 0.0002), and convenience (p = 0.0374) domains for DPI inhalers.

CONCLUSION: The DPI inhalers were associated with higher levels of satisfaction, performance, and convenience compared to MDI inhalers in the management of oral antidiabetic medications (OAD).

KEYWORDS: Obstructive airway disease, asthma, chronic obstructive pulmonary disease, metered-dose inhaler, dry powder inhaler.

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) and asthma are classified as obstructive airway diseases (OAD) but have distinct pathophysiological mechanisms. COPD is characterized by airway and alveolar destruction and chronic inflammation caused by exposure to harmful particles, such as tobacco smoke. In contrast, asthma is primarily characterized by airway hyperresponsiveness and inflammation triggered by various environmental stimuli[1]. Globally, both conditions present significant public health challenges. "World Health Organization (WHO)" reports that approximately 235 million people are currently affected by asthma, while around 65 million people suffer from moderate to severe COPD. In Pakistan, the prevalence rates for asthma and COPD are estimated at 13.3% and 13.8%, respectively, highlighting a substantial healthcare burden in the region[2-4].

The main treatment options in OADs are bronchodilators and steroids, while antibiotics are needed infrequently. Bronchodilators are typically administered to the airways through inhalation. Multiple inhaler devices are available in the market, including "metered-dose inhalers (MDI)" and "dry powder inhalers (DPI)" [5]. The mechanism of drug delivery in MDI involves the generation of pressure after physical inhaler actuation, enabling the particles to be dispensed. In DPIs, the patient drives the inhalation of particles via inspiration[5]. Learning a good inhaler technique has a significant impact on patient outcomes.[6] Incorrect technique, which leads to reduced drug delivery, affects lung function measures and exercise tolerance[4] and is associated with poorer disease outcomes[5].

Patient preference is a crucial component of device selection, as it influences compliance and adherence to therapy, ultimately leading to improved long-term outcomes[6,7]. A study showed that on the "Patient Device Experience Assessment Scale (PDEA)", patients gave Pulmicort Turbuhaler a considerably higher rating for usability than pMDIs (p=0.0005)[8]. Another study conducted in France, which aimed to identify preferences for convenience-related inhaler

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features, reported that patient preferences were most influenced by the form of the inhaler, the dose counter, and its reusability. The inhalers mostly preferred were L-shaped. Reusable inhalers and inhalers with dose counters were preferred, and the findings were noteworthy[9]. Another study showed that the mean satisfaction with convenience (based on PASAPQ) for pMDI was 34.4±4.8, and for Turbuhaler (DPI), it was 36.5±4.1[10].

The literature has shown that various methods and multiple forms of drugs from other populations have been used to assess patient preferences. In Pakistan, the available literature is insufficient to address the local population's preferences for various types of inhaler devices, so the present study was planned. This study aimed to evaluate patient preference for different inhaler devices in the treatment of OAD.

METHODOLOGY

This cross-sectional (descriptive) study was conducted at the Department of Pulmonology, Indus Hospital, Korangi Campus, Karachi, from July 2023 to January 2024, after obtaining prior approval from the "Institutional Review Board" (letter number: IRD_IRB_2019_20_005, dated: 11-Feb-2020). The inclusion criteria were patients of either gender, aged 18-70 years, presenting with OADs (COPD, asthma), irrespective of the duration of disease, and using DPI or MDI devices. The exclusion criteria were patients with acute exacerbations of obstructive airway disease. Those with cognitive dysfunctions or communication issues including language barriers and the inability to understand either procedure or technique, were also excluded. The individuals who were experiencing progressive and persistent symptoms such as shortness of breath and productive cough and their spirometry showed the post-bronchodilator ratio of <70% predicted, and irreversible airflow limitation through their lungs were labelled as COPD patients. Patients were informed about the objectives and safety aspects related to this study before its execution. Patients received assurances regarding the privacy of the data they submitted, and formal, informed, and written consents were obtained. A sample size of 100 was calculated, considering the mean satisfaction with convenience (based on PASAPQ) of pMDI as 34.4 ± 4.8 and that of Turbuhaler (DPI) as 36.5 ± 4.1,10 with a level of significance of 5% and a power of the test of 80%. A non-probability consecutive sampling technique was implemented for sample selection.

After recording the necessary demographics like age, sex, and smoking history, patient preference for the inhaler devices was also inquired about. Patients who were using a pMDI (a device that facilitates patient-independent aerosolization but requires satisfactory coordination upon actuation) containing Formoterol-Budesonide were given a DPI (a device that is convenient and lightweight but relies on patient inhalation technique to aerosolize the drug powder) containing the same drugs at the exact dosage for two weeks. Patients who were using DPI containing Formoterol-Budesonide were given pMDI containing the same medications at the precise dosage for two weeks. Patients were trained on the techniques for using the inhalers they received, and their preference between two inhaler devices was determined using a tool called PASAPQ. The PASAPQ is a straightforward, multi-item questionnaire used to assess patients with asthma and COPD regarding their preferences and level of satisfaction with respiratory inhalation devices. 7 It was designed primarily to gauge preferences and levels of satisfaction with various inhaler devices. The total score was computed using thirteen satisfaction questions. The performance domain consisted of questions 1 to 5, 10, and 11, and the convenience domain was constructed from questions 6 to 9, 12, and 13. The overall patient satisfaction score was investigated in Question 14. A seven-point rating system (1 represented extreme dissatisfaction, 2 dissatisfaction, 3 slightly unsatisfied, 4 neither unhappy nor satisfied, 5 somewhat satisfied, 6 satisfied, and 7 represented extreme satisfaction) was used to indicate responses to all questions. The total of the items in each domain was converted to a 0-100-point scale to obtain the domain scores. All relevant study data were gathered and documented on a specially designed proforma by the researchers themselves. Data analysis was performed using "IBM-SPSS Statistics", version 26.0. The quantitative variables were expressed by calculating means and the standard deviation. The categorical variables were presented in the form of frequency and percentage. An independent sample t-test was used to compare PAASAPQ scores between different study variables, with $p < 0.05$ considered significant.

RESULTS

In a total of 100 patients, the mean and standard deviation for age, height, weight, and BMI were noted as 51.64±13.52 years (ranging from 20-70 years), 158.67±10.52 cm (ranging from 150-190 cm), 58.32±17.34 kg (ranging from 45-90 kg), and 28.85±3.34 kg/m^2 (ranging from 23-33 kg/m^2), respectively. The frequency distribution of age showed that 71 (71.0%) patients were in the 18-45 years age group. There were 59 (59.0%) male and 41 (41.0%) female patients. Evaluation of the types of OAD showed that 49 (49.0%) patients had COPD, whereas asthma was present in 50 (51.0%) patients. Smoking status was positive in 49 (49.0%) patients. The characteristics of the cases are shown in **Table I**.

Out of 100 patients, 50 (50%) were using MDI inhalers, and 50 (50%) were using DPI inhalers. The mean PASAPQ scores were significantly higher in terms of satisfaction ($p = 0.0002$), performance ($p = 0.0002$), and convenience ($p = 0.0374$) domains for DPI inhalers, as shown in **Table II**.

Stratification concerning age ($p = 0.4312$), gender ($p =$

0.8168), type of OAD (p = 0.8802), and smoking status (p = 0.5780) did not reveal any significant differences in terms of mean PASAPQ satisfaction scores. The details are presented in **Table III**.

Table I: Frequency distribution of demographic and clinical characteristics of patients with obstructive airway disease (n=100)

Study variables		Frequency (% age)
Age (years)	18-45	29 (29%)
	46-70	71 (71%)
Gender	Male	59 (59%)
	Female	41 (41%)
Type of OAD	COPD	49 (49%)
	Asthma	51 (51%)
Smoking status	Yes	49 (49%)
	No	51 (51%)
Type of inhaler	Metered-dose inhaler	50 (50%)
	Dry powder inhaler	50 (50%)

Table II: Mean Patient Satisfaction Scores According to Type of Inhaler (n=100)

Mean PASAPQ scores	Metered-dose inhaler	Dry powder inhaler	P-value
Patient Satisfaction	72.70±6.36	76.48±2.90	0.0002
Performance Domain	37.16±5.51	40.48±2.32	0.0002
Convenience domain	35.54±1.19	36.00±0.98	0.0374

Table III: Age, Gender, Type of OAD, and Smoking Status Stratification Considering Mean Patient Satisfaction Scores (n=100)

Characteristics		Mean and standard deviation	P-value
Age (years)	18-45	75.24±4.57	0.4312
	46-70	74.32±5.54	
Gender	Male	74.69±5.19	0.8168
	Female	74.44±5.44	
Type of OAD	COPD	74.67±4.59	0.8802
	Asthma	74.51±5.89	
Smoking status	Yes	74.29±5.47	0.5780
	No	74.88±5.10	

DISCUSSION

The mean PASAPQ satisfaction scores were 72.70±6.36 and 76.48±2.90 in patients who used MDI inhalers and DPI inhalers, favoring DPI inhalers significantly (p=0.0002). Contoli M et al.[11] found that the majority of patients were generally satisfied with their DPI devices; however, those experiencing a higher burden of asthma symptoms reported lower levels of satisfaction with their DPIs. A study involving 1443 patients revealed that overall patient satisfaction with their inhaler was closely linked to treatment compliance (p < 0.001). Moreover, male gender (p<0.05) and fewer maintenance drugs (p<0.001) were also associated with compliance. It was also found that reductions in exacerbations were directly associated with inhaler satisfaction (R^2=0.03; p<0.001) [12]. Another study showed that asthma patients had a notably higher satisfaction level with the inhalers (p < 0.001) and were more satisfied with most items (70%)[13]. Regardless of the level of adherence or the type of non-adherence, asthmatic patients generally reported high satisfaction with their inhalers. Previous research has shown that factors such as younger age, effective disease control, prior inhaler training, and absence of unintentional non-adherence are significantly associated with greater inhaler satisfaction. However, this study did not identify any specific factors that influenced patient satisfaction scores[14]. There is a need for proactive surveillance and improved training regarding the inhalation method to enhance clinical outcomes, medication adherence, and patient satisfaction[15]. Beeh KM et al.[16] conducted a study that found comparable efficacy and safety between similar formulations of DPI and pressurized MDI in patients with COPD. These findings support the use of DPI as a viable treatment option, offering flexibility for both patients and healthcare providers.

Several types of inhaler devices are available for managing OAD, each with distinct features. It is essential to select a device that aligns with the patient's needs, preferences, and satisfaction while ensuring adequate disease control. Although no single device may be perfect for all patients, the broad range of options allows for the identification of a suitable device for each patient. Education is crucial, both for patients to develop proper inhaler techniques and for healthcare providers to make informed decisions, ensuring optimal device selection and practical use. Inhalable medications designed for individuals with asthma and COPD can be perplexing, even for healthcare professionals, owing to the plethora of available devices, each operating on different principles[17-19]. The DPI emerge as a valuable option for the majority of patients dealing with asthma or COPD. However, the widespread issue of suboptimal adherence and errors in device handling necessitates ongoing vigilance and patient education to navigate the potential pitfalls associated with inhalation therapy[20]. Researchers have also demonstrated that patients who receive exceptional guidance and training from physicians show better satisfaction scores for their inhaler devices; therefore, it is imperative that proper guidance and training be provided to all affected individuals[21].

Effective management of asthma and COPD relies on the appropriate selection and use of inhalation devices[22,23]. However, challenges such as disease severity, pulmonary function, manual dexterity, and

comorbidities like arthritis can complicate inhaler use, and no single device suits all patients[24]. In addition to these factors, patient engagement and satisfaction are crucial for adherence. Issues with inhaler use are particularly evident in children and older adults, making the selection of tailored devices essential. Common inhalers include nebulizers, pressurized metered-dose inhalers (MDIs), dry powder inhalers (DPIs), and soft mist inhalers. Each offers distinct technical properties, so a personalized approach to selecting the most suitable device can improve outcomes and adherence.

The major limitation of this research was that it was a single-centre study. More studies involving multiple study sites and a large number of OAD patients should be conducted to analyze further patients' preferences regarding various inhaler devices used in the contemporary world. There is also a need to guage the impact of patient satisfaction with inhaler devices on the disease outcomes of OAD.

CONCLUSION

The DPI inhalers are associated with higher levels of satisfaction, performance, and convenience compared to MDI inhalers in the management of obstructive airway disease. Patient education is vital for optimal disease management and proper inhaler technique. Healthcare professionals should be knowledgeable about the devices they prescribe and provide comprehensive support to patients in clinical practice.

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AUTHOR CONTRIBUTION

Rehman S: Data Collection, Drafting, responsible for data, approved for publication.

Umair M: Data Collection, Data Analysis, critical revisions, approved for publication.

Kaleemullah: Literature Review, Drafting, Critical Revisions, responsible for data, approved for publication.

Azam AR: Literature Review, drafting, critical revisions, responsible for data, approved for publication.

Hussain M: Conceptual framework, Data Interpretation, proofreading, critical revision, approved for publication.

Akhtar S: Conception, proofreading, critical revisions, approved for publication.

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