

# ADHERENCE TO INHALER THERAPY IN PATIENTS WITH CHRONIC OBSTRUCTIVE PULMONARY DISEASE AND CONTRIBUTING FACTORS

**Sevda Tüzün Özdemir**

Izmir Kavram Vocational School

**Öznur Usta Yeşilbalkan**

Ege University

**Asiye Akyol**

Ege University

## **Abstract**

Chronic Obstructive Pulmonary Disease (COPD) is a leading cause of morbidity and mortality worldwide, with inhaler therapy being a cornerstone of its management. This review aims to evaluate adherence to inhaler therapy among COPD patients and identify factors influencing this adherence. A comprehensive literature search was conducted using databases such as PubMed, Scopus, and Web of Science, focusing on studies published between 2010 and 2023. The findings indicate that adherence rates to inhaler therapy range between 20% and 60%, primarily due to factors such as patient education, inhaler technique, and comorbid conditions. The review highlights the importance of effective patient education and simplified inhalation devices to improve adherence and, consequently, health outcomes in COPD patients.

**Keywords:** chronic obstructive pulmonary disease, inhaler therapy, treatment adherence, quality of life, barriers to adherence

## **Introduction**

The definition of Chronic Obstructive Pulmonary Disease (COPD) was updated in 2023 by the Global Initiative for Chronic Obstructive Lung Disease (GOLD) as 'a heterogeneous condition characterized by chronic respiratory symptoms (dyspnea, cough, sputum) and persistent, often progressive airway obstruction, caused by airway (bronchitis/bronchiolitis) or alveolar (emphysema) abnormalities' (GOLD 2021). Today, COPD has become the third leading cause of death worldwide, accounting for 5.5% of all deaths (WHO, 2003; WHO, 2024). In our country, respiratory diseases rank third among the most common causes of death, with 61.5% of these deaths attributed to COPD (hsgm.saglik). The World Health Organization (WHO) established the Global Alliance against Chronic Respiratory Diseases (GARD) to reduce the prevalence and incidence of chronic diseases, prevent their occurrence, and create an emergency action plan in response to the increasing prevalence of chronic diseases associated with extended life expectancy (WHO, 2008). In our country, the Turkish Thoracic Society (TTD) became a member of GARD in 2005 and between 2009-2013, developed the "National Program for the Prevention and Control of Chronic Airway Diseases – Action Plan" (Yıldız et al., 2013). Although COPD is a major public health issue worldwide, it is a chronic disease that remains relatively unknown to the general public. It is estimated that there are between 3-5 million COPD patients in our country, but only 300,000-500,000 of these patients have been diagnosed (saglik.gov). Yıldız et al. (2013), in a study conducted with 8,342 people living in urban and rural areas to assess asthma and COPD awareness within the Turkish population as part of the "Chronic Airway Diseases Prevention and Control Program," found that public awareness and knowledge levels regarding these diseases were low (Yıldız et al., 2013).

The objective of this review is to comprehensively assess the adherence to inhaler therapy in patients with Chronic Obstructive Pulmonary Disease (COPD) and to identify the various factors influencing this adherence. Given the significant global health burden posed by COPD, characterized by high morbidity and mortality rates, it is essential to evaluate the extent of treatment compliance and its implications for patient outcomes. By analyzing the existing literature from 2010 to 2023, this review aims to elucidate the barriers and facilitators of adherence to inhaler therapy, highlighting the critical role of patient education, awareness, and the usability of inhalation devices. Furthermore, the review seeks to provide insights that could inform clinical practices and interventions designed to enhance treatment adherence, ultimately improving the management and quality of life for COPD patients.

Previous studies have highlighted that medication adherence in chronic diseases is influenced by various factors, including the complexity of the treatment regimen, patient education, and social support (Vrijens et al., 2016). Furthermore, inadequate inhaler technique remains a significant barrier to effective COPD management, as improper use of inhalers can lead to suboptimal drug delivery and poor treatment outcomes (Bourbeau & Bartlett, 2008; Bosnic-Anticevich et al., 2017). This review will focus on the diverse factors influencing adherence to inhaler therapy, including the patient's understanding of their condition, the effectiveness of educational interventions, and the usability of different inhalation devices (Hamine et al., 2015; Jardim & Nascimento, 2019). Addressing these factors is critical for improving treatment adherence and enhancing the overall management of COPD patients.

## **Methodology**

This study conducted a systematic literature review to identify factors influencing adherence to inhaler therapy among patients with Chronic Obstructive Pulmonary Disease (COPD). The research utilized the databases PubMed, Scopus, Web of Science, and Google Scholar, employing keywords such as "Chronic Obstructive Pulmonary Disease (COPD)," "inhaler therapy adherence," and "factors affecting adherence." The literature search was limited to studies published within the past 10 years in English and Turkish.

### ***Inclusion Criteria***

- *Patient Profile*: Studies focusing on individuals diagnosed with COPD.
- *Treatment Type*: Research focusing specifically on inhaler therapy.
- *Adherence Factors*: Studies that examine psychological, social, economic, and other factors influencing adherence to treatment were prioritized.
- *Publication Language*: Only articles published in English and Turkish were included.
- *Publication Date*: Studies published within the last 10 years were prioritized to ensure the most current information.
- *Study Type*: Both qualitative and quantitative studies, including literature reviews, surveys, clinical observations, and case series on adherence to inhaler therapy, were included.

### ***Exclusion Criteria***

- *Other Diseases*: Studies focusing on respiratory diseases other than COPD (e.g., asthma, pulmonary fibrosis) were excluded.
- *Alternative Treatments*: Studies on treatment methods other than inhaler therapy (e.g., oral medications, surgical interventions) were excluded.
- *Theoretical Studies*: Purely theoretical articles or literature evaluations were excluded.
- *Publication Language*: Articles published in languages other than English and Turkish were excluded.
- *Full-Text Access*: Studies without accessible full-text versions were excluded.

### ***Literature Screening Process***

In the initial phase of the literature review, a broad pool of literature was identified using predefined keywords. Articles were screened by title and abstract, followed by exclusion based on the inclusion and exclusion criteria. In the second phase, the full text of each eligible article was reviewed, and those meeting the criteria were analyzed.

### ***Comparison and Evaluation of Findings***

The findings of each reviewed study were compared in terms of their impact on adherence to inhaler therapy in COPD patients. In the analysis of results, similarities and differences in factors affecting adherence were considered to create an integrative assessment aligned with the study's objectives.

### Chronic Obstructive Pulmonary Disease and Classification

In COPD, harmful gases and particles cause inflammation in the airways, leading to chronic airway obstruction, hyperinflation, mucus hypersecretion, reduced diffusion, and as a result, hypoventilation, hypoxemia, hypercapnia, and respiratory acidosis (Başyigit, 2010). The primary risk factors contributing to these pathophysiological changes include tobacco use, passive smoking, occupational exposure to various chemical gases, air pollution, genetic factors, and malnutrition (Biroł & Sütçü, 2020) (Table 1). The permanent damage caused to the airways due to COPD results in symptoms such as dyspnea, cough, and sputum production, as well as wheezing, weight loss, loss of appetite, insomnia, fatigue, activity intolerance, anxiety, and depression (Bal Özkaptan & Kapucu, 2015) (Table 2).

**Table 1. Risk Factors for COPD**

<ul style="list-style-type: none"> <li>• Smoking</li> <li>• Passive smoking</li> <li>• Occupational exposure to various chemical gases</li> <li>• Air pollution</li> <li>• Genetic factors</li> </ul>	<ul style="list-style-type: none"> <li>• Malnutrition</li> <li>• Gender</li> <li>• Low socioeconomic status</li> <li>• Infections</li> </ul>
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**Table 2. COPD Symptoms and Signs**

<ul style="list-style-type: none"> <li>• Dyspnoea</li> <li>• Cough</li> <li>• Phlegm</li> </ul>	<ul style="list-style-type: none"> <li>• Wheezing</li> <li>• Loss of appetite</li> <li>• Weight loss</li> </ul>	<ul style="list-style-type: none"> <li>• Insomnia</li> <li>• Fatigue</li> <li>• Anxiety</li> </ul>	<ul style="list-style-type: none"> <li>• Depression</li> <li>• Puckered lip breathing</li> <li>• Activity intolerance</li> </ul>
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The Global Initiative for Chronic Obstructive Lung Disease (GOLD) classifies COPD into four stages based on FEV1 levels, and defines COPD in pulmonary function tests as FEV1/FVC < 70% (GOLD 2021) (Table 3).

**Table 3. In patients with FEV1/FVC < 70%**

<b>Stage 1</b>	<b>Mild</b>	FEV <sub>1</sub> ≥ %80 predicted
<b>Stage 2</b>	<b>Moderate</b>	%50 ≤ FEV <sub>1</sub> < %80 predicted
<b>Stage 3</b>	<b>Severe</b>	%50 ≤ FEV <sub>1</sub> < %80 predicted
<b>Stage 4</b>	<b>Very severe</b>	FEV <sub>1</sub> < %30 predicted or FEV <sub>1</sub> < %50 predicted plus chronic respiratory failure

### Chronic Obstructive Pulmonary Disease and Treatment

The priority in the treatment of chronic obstructive pulmonary disease (COPD) is the reduction of risk factors, and both pharmacological and non-pharmacological treatment methods are applied. Additionally, the treatment of COPD patients may vary depending on whether the patient is in a stable phase or experiencing an exacerbation (Ergin & Muz, 2019).

Bronchodilators are the main agents in the pharmacological treatment of stable COPD (GOLD 2021). However, pharmacological treatment should only be given to symptomatic patients, and it is not recommended for patients diagnosed with COPD without symptoms (GOLD 2021). Pharmacological treatments include bronchodilators, inhaled corticosteroids, mucolytics (mucokinetics, mucoregulators), antioxidant agents (N-acetylcysteine, carbocysteine, erdosteine), triple combination therapies, oral glucocorticoids, antibiotics, and vaccines (GOLD 2021).

Non-pharmacological treatment methods include patient education, self-management and integrated care, physical activity, pulmonary rehabilitation, home mechanical ventilation, palliative care, end-of-life care, oxygen therapy, respiratory support, surgical interventions, bullectomy, lung transplantation, and interventional treatments such as bronchoscopy (GOLD 2021; Ergin & Muz, 2019).

The aim of treatment is to prevent the progression of the disease, improve existing symptoms, increase the patient's exercise tolerance, prevent and/or treat recurrent acute attacks, prevent and treat potential complications, prevent exacerbations, prolong life expectancy, and enhance the quality of life (GOLD 2021). To achieve these goals, patients must receive sufficient education to ensure adherence to the treatment process. This education should include topics such as smoking cessation and avoidance of risk factors, basic information about the disease, principles of medication use and effective inhalation techniques, prevention and early detection of exacerbations, dyspnea management strategies, maintaining physical activity, breathing exercises, bronchial hygiene techniques, energy conservation and techniques to simplify daily tasks, proper nutrition, hydration, and dietary recommendations (Bal Özkaptan & Kapucu, 2015).

### **Adherence to Inhaler Therapy in Chronic Obstructive Pulmonary Disease**

Chronic obstructive pulmonary disease (COPD) requires adherence to treatment for long-term management, care, and effective health management. However, it is known that adherence to treatment is only 50% among patients, which poses a significant challenge in chronic disease management (Hamine et al., 2015). Insufficient adherence to treatment leads to increased rates of COPD exacerbations, morbidity, and mortality, resulting in an average annual cost increase of \$100 billion (Aydos, 2021). Treatment adherence refers to the extent to which an individual complies with medical treatments or health recommendations. The patient's adherence to the prescribed treatment plays a crucial role in the effectiveness of the treatment administered (Özbek Yazıcı et al., 2006).

Inhaled bronchodilator and steroid medications are frequently used in the treatment of chronic obstructive pulmonary disease. Therefore, inhalation therapy is one of the primary treatment methods for COPD (Şeker, 2019; Navaie et al., 2020). The clinical management of symptoms, such as dyspnea, which commonly causes anxiety and fear in patients, primarily relies on pharmacotherapies aimed at achieving continuous bronchodilation through inhaler therapy (Navaie et al., 2020). Adherence to the dosing regimen of inhaled medications and the ability to use the device correctly enhance the bioavailability of the medication, improve treatment effectiveness, prevent COPD exacerbations, and increase appropriate symptom management and quality of life for patients (Şimşekli Bakırhan, 2018; Kara, 2002; Özkan, 2013; Ammari, 2016; Bosnic-Anticevich, 2016). To achieve these positive effects aimed at COPD treatment, it is essential to provide effective education to patients regarding the correct use of inhalation devices and dosage adjustments (Scullion, 2018). The ease of use and portability of the device enhance patient satisfaction and adherence to treatment (Dal Negro et al., 2016; Miravittles et al., 2016). In a study by Chrystyn et al. investigating the relationship between inhaler application satisfaction, treatment adherence, and health status in 1,443 COPD patients, a significant relationship was found between inhaler application satisfaction and treatment adherence, with this significant effect reducing exacerbations and improving treatment adherence and quality of life (Chrystyn et al., 2014).

Adherence to inhaler therapy among COPD patients ranges from 20% to 60%, indicating a low level of compliance. A systematic review on this topic found that the adherence rate to inhaler therapy among COPD patients was 46%, with inattention identified as the primary reason for non-compliance (Świątoniowska et al., 2020). In a randomized controlled trial conducted in our country involving COPD patients, it was determined that the planned inhaler therapy education provided to patients reduced the level of dyspnea and increased self-efficacy and self-care ability (Ergin et al., 2019). A study conducted in Vietnam also reported that the inhaler use and medication adherence among COPD patients were low. It found that severe dyspnea, greater deterioration in health status, increased exacerbations, and higher rates of hospitalization negatively affected proper inhaler use and treatment adherence (Ngo et al., 2019). The literature indicates that patients receiving education on inhaler medication application for COPD show improved treatment adherence and medication use skills, while the frequency of application errors decreases (Özkan, 2013; Sanchis et al., 2016; Göris, 2013; Dhand et al., 2012).

### **Factors Affecting Adherence to Treatment in Chronic Obstructive Pulmonary Disease**

Adherence to inhaler therapy impacts patients' clinical outcomes, quality of life, morbidity and mortality rates, and costs. Therefore, healthcare professionals should assess patient adherence and inhaler medication technique at each visit and identify barriers to treatment adherence, taking necessary precautions (Ceylan, 2018). Turan et al. (2016) reported that approximately 65% of COPD patients who attended regular doctor appointments did not receive guideline-concordant treatment. Moreover, patients who had not received inhaler education in the past year exhibited low inhaler skill scores. In both groups, the most common errors in inhaler use (74.3%) were related to exhalation before and after inhalation (Turan et al., 2016).

According to a report published by the World Health Organization (WHO), three types of behaviors that may hinder adherence to inhaler therapy have been identified: irregular non-compliance, unintentional non-compliance, and intentional non-compliance (WHO, 2003). Irregular non-compliance is unintentional and associated with missed doses due to forgetfulness, changing schedules, or busy lifestyles. Unintentional non-compliance arises from a lack of understanding of the prescribed regimen and/or the importance of adherence, leading to misunderstandings about how often an inhaler should be used (resulting in underuse or overuse), proper inhaler technique, and the functioning or significance of the treatment. Intentional non-compliance refers to patients deliberately modifying or discontinuing treatment because they feel better or believe they no longer need their medication. Patients may discontinue inhaled corticosteroids due to their short- or long-term side effects, unpleasant taste, complexity of use, improvement in symptoms, disruption of daily routines, or the belief that the disadvantages outweigh the benefits (Jardim & Nascimento, 2019; WHO, 2003).

Factors complicating adherence to inhaler therapy in COPD treatment include the patient's age, education level, presence of comorbidities, training on medication administration and its repetition, duration of the disease, inadequate education or information about the disease process or comorbidities, perceived negative effects of treatment, beliefs that the disadvantages of treatment outweigh the advantages, patient acceptance and preferences, medication costs, and the complexity of inhaler device usage (Restrepo, 2008; Normansell, 2017; WHO, 2003; Bryant, 2013). In a randomized controlled trial conducted by Ergin et al., it was determined that approximately 91% of COPD patients in the intervention group correctly administered their inhaler medications, while all patients in the control group used them incorrectly. A study on factors affecting the correct use of inhaler devices in COPD patients found that 74% of patients used their medications correctly, with adherence rates for metered-dose inhalers (MDI) ranging from 66.3% and between 76% and 81% for dry powder inhalers (DPI). Advanced age (over 60 years), being illiterate or only having completed primary school, a complaint duration of less than three months, and the selection of MDI devices were identified as significant factors in incorrect use (Başlılar et al., 2018). Vanoverschelde et al. (2020) investigated factors associated with poor inhaler technique and treatment non-compliance in COPD patients, concluding that age and smoking status were significant variables in treatment non-compliance, with younger patients exhibiting higher rates of non-compliance. Additionally, it was found that patients who had never smoked had 85% better treatment adherence compared to those who continued to smoke.

Clinical studies have shown that although the compliance of COPD patients with prescribed treatments ranges from 70% to 90%, the actual compliance observed in clinical settings is only between 10% and 40%. Several factors contribute to this discrepancy in compliance within clinical environments, including patient characteristics such as beliefs, psychological status, cognitive functioning, self-efficacy, and comorbid conditions; social factors including the patient-prescriber relationship, access to medication, social support, and training and follow-up on devices; as well as pharmacological treatment factors, including the application method, type of inhaler, dosing regimen, polypharmacy, and concerns about side effects (Jardim and Nascimento, 2019; Bourbeau and Bartlett, 2008).

One of the most significant pharmacological factors that can exacerbate treatment noncompliance is the use of complex inhaler devices. These devices can lead to incorrect inhaler usage, increased daily dosing frequency, polypharmacy, and adverse effects. Various factors, including the number of devices, can predict the incorrect use of inhalers among outpatient COPD patients. It has been shown that the average number of errors made is lower when only one device is used compared to when three inhaler devices are utilized (Machado et al., 2015; Jardim and Nascimento, 2019). In a study comparing two cohorts, one using similar inhalation technique devices ("similar device cohort") and

another using a "mixed device cohort," involving 16,250 COPD patients, it was demonstrated that patients using similar devices experienced an 18% reduction in the incidence of COPD exacerbations and used 46% less reliever medication compared to those using mixed devices (Bosnic-Anticevich et al., 2017). Therefore, the simplicity of inhaler device usage contributes to increased patient compliance and improved outcomes.

## Conclusion

In conclusion, COPD symptoms are a difficult chronic disease to manage because they negatively affect the quality of life, mortality, and morbidity rates of patients. To prevent the disease from entering exacerbation periods and to manage the symptoms correctly, it is important to apply the treatment properly and ensure compliance with the treatment. Adherence to inhaler therapy remains a significant challenge in the management of COPD, despite the availability of effective treatments. Several factors influence patient compliance, including individual patient characteristics, the complexity of inhaler devices, and the level of education and support provided. Clinical studies indicate that while treatment adherence is reportedly high in controlled environments, real-world adherence rates are alarmingly low. Key barriers include the use of complex inhaler devices, polypharmacy, and insufficient patient education.

Patient education is essential for improving treatment outcomes. Education programs focused on inhaler techniques, symptom management, and the importance of adherence have demonstrated success in reducing exacerbations and enhancing quality of life. The results of this review highlight the need for healthcare professionals to implement structured education programs that can effectively equip patients with the necessary knowledge and skills to manage their condition.

Device simplicity also plays a critical role; the use of simpler, more user-friendly inhaler devices is associated with fewer errors and better adherence. Cohort studies suggest that patients using similar inhalation technique devices experience better outcomes, with fewer exacerbations and reduced medication use. Healthcare support is crucial for enhancing compliance. Continuous assessment of patient adherence and inhaler technique by healthcare providers, along with addressing barriers such as medication costs and psychological factors, is vital.

Training nurses should plan regular training sessions for patients, explaining inhaler training procedures through demonstration techniques. Patients should practice these techniques, with immediate corrections for any errors. Additionally, when selecting inhaler devices, it is especially important to choose devices that are simple to use to ensure patient compliance with the treatment. By addressing these factors, it is possible to improve treatment adherence, leading to better disease management, reduced healthcare costs, and improved quality of life for COPD patients. Future research should focus on developing targeted interventions that address the multifaceted barriers to adherence, ultimately contributing to more effective long-term disease management.

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**Received: 26 September 2024.**

**Accepted: 6 November 2024**