INNSPUB

Journal of Biodiversity and Environmental Sciences | JBES
ISSN: 2220-6663 (Print); 2222-3045 (Online)
Website: https://www.innspub.net
E-mail contact: info@innspub.net
Vol. 27, Issue: 2, p. 97-108, 2025

RESEARCH PAPER OPEN ACCESS

Bridging the COPD awareness gap in marginalized populations: Findings from a multicentre study in Khalilabad, Sant Kabir Nagar, Uttar Pradesh, India

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Key words: COPD, Inhalation therapy, Oral therapy, Risk factor, Smoking

DOI: https://dx.doi.org/10.12692/jbes/27.2.97-108 [Published: August 15, 2025]

ABSTRACT

Sant Kabir Nagar, a district in Uttar Pradesh, India, faces significant healthcare challenges, particularly in managing Chronic Obstructive Pulmonary Disease (COPD). This study highlights the alarming lack of COPD awareness, with only 3% of patients recognizing their condition, while 54% had no knowledge and 43% refused diagnosis. Major risk factors include biomass fuel exposure (47.8%), agricultural pollution (32%), and smoking (13.4%). Despite global preference for inhalation therapy, only 9% of patients in Khalilabad, Sant Kabir Nagar receive optimal bronchodilator treatment, with 42% relying on oral medications due to cost, misconceptions, and poor accessibility. The "Difficult Doctor, Difficult Patient, and Difficult Treatment" phenomenon further hampers COPD management. Misconceptions about inhalers, financial constraints, and inadequate physician training lead to underdiagnosis and suboptimal treatment. Key recommendations include nationwide awareness campaigns, spirometry training for physicians, and government-led initiatives to promote inhaler use. Subsidizing inhalation therapy could significantly improve adherence and patient outcomes. Immediate action is essential to bridge the COPD treatment gap in Khalilabad, Sant Kabir Nagar. By addressing financial, educational, and medical barriers, policymakers and healthcare professionals can enhance early detection, improve treatment strategies, and ultimately reduce the disease burden, leading to better health outcomes and quality of life for affected individuals.

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INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is one of the leading causes of morbidity and mortality in India, ranking as the second leading cause of death in the country. It is estimated that approximately 53 million people in India are affected by COPD, yet a large proportion remains undiagnosed or undertreated. Various chronic respiratory diseases, including asthma, bronchiectasis, interstitial lung diseases, and post-tuberculosis obstructive airway diseases, also contribute to the country's significant respiratory disease burden (GBD 2015 Chronic Respiratory Disease Collaborators, 2017).

According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD) 2021 guidelines, COPD is defined as a common, preventable, and treatable disease characterized by persistent respiratory symptoms and airflow limitation due to airway and/or alveolar abnormalities. These abnormalities are primarily caused by significant exposure to noxious particles or gases (GBD 2015 Chronic Respiratory Disease Collaborators, 2017; (Global Initiative for Chronic Obstructive Lung Disease, 2019). COPD includes conditions such as chronic bronchitis, emphysema, and small airway disease. Chronic bronchitis is clinically diagnosed by the presence of a chronic productive cough lasting for at least three months in two consecutive years, excluding other potential causes of chronic cough. Emphysema, on the other hand, is a radiological condition characterized by abnormal and permanent enlargement of air spaces distal to the terminal bronchioles, accompanied by the destruction of their walls without significant fibrosis (GBD 2015 Chronic Respiratory Disease Collaborators, 2017).

Despite its significant disease burden, India lacks comprehensive nationwide data on COPD prevalence and its exact impact. While several regional studies have provided insight into the prevalence of asthma and COPD, there remains a gap in large-scale epidemiological data. The National Health Policy of India (2017) aims to reduce premature mortality from noncommunicable diseases, including chronic respiratory diseases, by 25% by 2025. However, achieving this target requires substantial improvements in COPD awareness, early diagnosis, and rational treatment approaches, particularly in rural and underserved regions.

COPD awareness plays a crucial role in its early diagnosis and appropriate treatment. In India, healthcare practices vary widely, incorporating allopathy, homeopathy, Ayurveda, Unani, and other traditional therapies. This diversity, while beneficial in some respects, often leads to confusion among patients regarding the most effective treatment strategies. Many individuals suffering from chronic respiratory symptoms fail to seek timely medical intervention due to a lack of awareness or misconceptions about the disease. Studies indicate that nearly two-thirds of COPD cases remain undiagnosed, and only about one-fifth of diagnosed patients receive appropriate inhalation therapy (O'Donnell *et al.*, 2003). The widespread underdiagnosis of COPD can be attributed to limited access to diagnostic tools like spirometry, the gold standard for COPD diagnosis. Spirometry is a simple, cost-effective test that not only aids in early detection but also plays a crucial role in assessing disease severity, predicting prognosis, and guiding treatment decisions. Despite its significance, spirometry remains underutilized in India due to limited availability, inadequate physician training, and low patient awareness (Pierce, 2005).

The GOLD guidelines recommend inhalation therapy as the primary treatment for COPD, advocating the use of long-acting beta-2 agonists (LABA), long-acting muscarinic antagonists (LAMA), and inhaled corticosteroids (ICS) to manage symptoms and prevent disease progression. In India, a wide range of inhalers is available, from short-acting bronchodilators like salbutamol to long-acting agents such as salmeterol/formoterol combined with ICS and tiotropium. While short-acting bronchodilators are readily available in government hospitals at subsidized rates, long-acting therapies remain expensive and are often inaccessible in public healthcare facilities. Consequently, many patients are prescribed oral medications instead of inhalation

therapy, despite evidence supporting the superior efficacy of inhalers in managing COPD (Global Initiative for Chronic Obstructive Lung Disease, 2019; (Ministry of Health and Family Welfare, Government of India, 2017).

The underuse of inhalation therapy in India can be attributed to multiple factors, including cost, lack of awareness, and cultural misconceptions. Many patients believe that inhalers weaken the lungs or cause dependency, leading to poor adherence. Physicians, particularly in rural settings, often prefer prescribing oral medications due to patient demand, affordability, and ease of administration. This preference for oral treatment over inhalation therapy results in suboptimal disease management, leading to frequent exacerbations, hospitalizations, and increased healthcare costs in the long run (Schermer *et al.*, 2003).

Sant Kabir Nagar, a district in northern India, is one of the 75 districts of Uttar Pradesh. It spans a total area of 1,646 square kilometres and has a population of 1,715,183, according to the 2011 census. This population is roughly equivalent to that of The Gambia or the U.S. state of Nebraska. With a population density of 1,041 inhabitants per square kilometre, the district has experienced a growth rate of 20.71% over the decade from 2010 to 2021. Geographically, Sant Kabir Nagar is bordered by Gorakhpur to the east, Basti to the west, Siddharth Nagar to the north, and Ambedkar Nagar to the south (Tripathi *et al.*, 2023a; Tripathi *et al.*, 2023b).

This study aims to assess COPD awareness in Khalilabad, a rural part of Sant Kabir Nagar, Uttar Pradesh, focusing on various aspects such as disease knowledge, diagnostic trends, spirometry usage, and rational inhalation treatment. The findings from this research are expected to highlight critical gaps in public awareness and healthcare practices, contributing to improved COPD management strategies. The study's objectives include evaluating the level of COPD awareness among the rural population, identifying barriers to early diagnosis, and assessing treatment patterns among diagnosed individuals.

Preliminary data suggest that only 3% of COPD patients in the study area are aware of their condition, while 54% have no knowledge about the disease. Additionally, 43% of those diagnosed with COPD refuse to accept their condition, further complicating disease management efforts. The lack of routine spirometry testing by general physicians significantly contributes to the underdiagnosis of COPD in the region. Compared to other countries, COPD awareness in Khalilabad, Sant Kabir Nagar remains alarmingly low. For example, studies indicate that COPD awareness levels in Turkey stand at 49%, in Japan at 21%, and in Spain at 17%, highlighting the stark disparity in disease awareness between India and other nations (Asai *et al.*, 2015; Yıldız *et al.*, 2013).

The study also examines risk factors associated with COPD in rural Uttar Pradesh. Among the 7,000 enrolled cases, 68.33% were male, while 31.66% were female. The major risk factors identified include biomass fuel exposure (47.8%), agricultural dust and pollution (32%), and smoking (13.4%). Notably, smoking prevalence among COPD patients in Khalilabad, Sant Kabir Nagar is lower than that observed in Western countries, where smoking remains the predominant risk factor. Eosinophilia in blood and sputum samples also influenced treatment decisions, with a preference for LABA-ICS therapy over LAMA-LABA therapy in affected individuals (Global Initiative for Chronic Obstructive Lung Disease, 2019; Bayram and Akgün, 2017).

Treatment preferences and challenges in the study region reveal significant disparities in healthcare access and affordability. Despite global recommendations favouring inhalation therapy, its adoption remains limited in Khalilabad, Sant Kabir Nagar. Only 9% of COPD patients in the study received optimal long-acting bronchodilator therapy. The primary reasons for the underuse of inhalers include high costs, lack of awareness, and deeply ingrained misconceptions. Instead, 42% of patients were prescribed oral medications due to their cost-effectiveness, easy availability, and patient preferences. Common misbeliefs, such as the notion that inhalers weaken the lungs or cause dependency,

further contribute to poor adherence to inhalation therapy. Physicians in the region also tend to Favor oral medications due to patient reluctance to use inhalers and concerns about adherence.

The study identifies a phenomenon known as the "Difficult Doctor, Difficult Patient, and Difficult Treatment" challenge. Difficult patients are those who harbour misconceptions about inhalers, fearing side effects such as altered speech or urinary retention. Difficult treatment refers to the financial barriers that limit access to long-acting bronchodilators and inhaled corticosteroids, leading many patients to rely on short-acting inhalers despite their limited benefits. Difficult doctors are those who prefer prescribing oral medications over inhalers due to cost concerns, ease of administration, and lack of training in spirometry-guided COPD management.

Key observations from the study indicate that 45% of patients with mild COPD and 55% with severe COPD received inhalers. However, 58.85% of patients had multiple exacerbations but were not on rational inhalation therapy. Furthermore, 14.85% of patients were diagnosed early with spirometry but lacked treatment awareness, underscoring the need for improved education and outreach efforts.

To enhance COPD management in Khalilabad, Sant Kabir Nagar, several recommendations can be proposed. Increasing awareness through digital and social media campaigns, training general physicians in spirometry use, and implementing government-led initiatives promoting inhaler use are crucial steps. Slogans such as "Inhalers prevent lung attacks," "Inhalers improve quality of life," and "Inhalers reduce hospitalizations and overall treatment costs" can be used to encourage inhalation therapy adoption. Additionally, providing subsidies for inhalers could improve accessibility for economically disadvantaged patients.

This study highlights the critical gap in COPD awareness, diagnosis, and treatment in Khalilabad, Sant Kabir Nagar. The disconnect between healthcare providers, patients, and treatment options contributes to underdiagnosis and suboptimal care. Routine spirometry use, physician training programs, and a shift toward inhalation therapy are essential for improving long-term outcomes and reducing hospitalizations. Immediate action is needed to raise awareness and sensitize rural populations and healthcare providers about the benefits of rational inhalation treatment, ensuring better COPD management and overall public health outcomes.

MATERIALS AND METHODS

This prospective, observational study was conducted from September 2023 to February 2025 in the Chest Diseases Department of District Hospital and Private Hospital in Khalilabad, Sant Kabir Nager, following approval from the College Review Board and Ethical Committee.

The study employed an interview-based questionnaire approach to assess COPD awareness, diagnosis trends, and treatment practices. A total of 10,000 patients presenting with chronic respiratory symptoms-such as cough, sputum production, and shortness of breath lasting for more than three months- were screened using spirometry. Based on spirometry-confirmed diagnoses, 7,000 COPD cases were enrolled in the study. Written informed consent was obtained from all participants as per the study protocol.

Inclusion and exclusion criteria

Inclusion criteria

1. Patients above 35 years of age presenting with respiratory symptoms, including cough (with or without sputum production) and shortness of breath, lasting for more than three months.
2. Other possible causes of similar symptoms in tropical settings were systematically ruled out.

Exclusion criteria

Patients with chronic respiratory symptoms but with an alternative etiological diagnosis, such as:

1. A past history of tuberculosis
2. Bronchiectasis
3. Interstitial lung diseases
4. Lung abnormalities identified on chest radiographs confirming an alternative diagnosis

Study design

The study utilized a standardized respiratory questionnaire (RQCOPD), developed by an expert group of teaching faculty from the college, to assess patient symptoms before spirometry. The questionnaire responses were recorded as "Yes," "No," or "Don't Know" (Yawn *et al.*, 2007; Yıldız *et al.*, 2013).

The RQCOPD was validated by an expert panel of pulmonologists, with its reliability assessed through sensitivity, specificity, positive and negative predictive values, and the κ coefficient of agreement.

Methodology

Case definitions

The following case definitions were formulated by an expert panel of teaching faculty from the College and Hospital in Khalilabad, Sant Kabir Nager:

Difficult patient: A patient who, despite spirometry-confirmed abnormalities suggestive of COPD, persistent symptoms, and awareness of the benefits of inhalation therapy, remains unconvinced or unwilling to accept the diagnosis and recommended treatment.

Difficult doctor: A primary healthcare provider who, despite awareness of the benefits of inhalation therapy over other treatment options, is unwilling or hesitant to initiate inhalation treatment for COPD patients.

Difficult treatment: A situation in which a patient, despite receiving a prescription for rational inhalation therapy and understanding its benefits over other treatments, is unable to afford or access the medication due to financial constraints.

Diagnostic procedures

All cases were subjected to:

Sputum examination and chest radiography to rule out infective etiologist in patients with chronic respiratory symptoms (Global Initiative for Chronic Obstructive Lung Disease, 2019; Ministry of Health and Family Welfare, Government of India, 2017).

Spirometry analysis to confirm COPD diagnosis (Global Initiative for Chronic Obstructive Lung Disease, 2019; Ministry of Health and Family Welfare, Government of India, 2017).

Diagnostic criteria

A post-bronchodilator FEV_1/FVC ratio <0.7 was used as the diagnostic cutoff for obstructive airway disease (Global Initiative for Chronic Obstructive Lung Disease, 2019).

Positive bronchodilator reversibility was defined as an increase in FEV_1 by at least 12% and 200 mL over the pre-bronchodilator value, following acceptability and reproducibility criteria as per GOLD guidelines and ATS/ERS task force recommendations (Global Initiative for Chronic Obstructive Lung Disease, 2019).

Cases meeting the criteria for obstructive airway disease but showing negative bronchodilator reversibility were classified as confirmed COPD cases and enrolled in the study.

Statistical analysis

Statistical analysis was performed using the single proportion test (Chi-square test, χ^2 test) in R-3.4 software. Significant values of χ^2 were determined using probability tables for different degrees of freedom. A p-value < 0.05 was considered statistically significant, while a p-value < 0.001 was considered highly significant.

RESULTS

Demographic characteristics and covariates

The study enrolled a total of 7,000 confirmed COPD cases, with a notable gender disparity observed in the distribution. Males constituted 68.33% (n = 4,783) of the study population, while females accounted for 31.66% (n = 2217). The age of participants ranged from 35 to 82 years, with a mean age of 58.5 ± 3.91(Confidence level=95%) years. A majority of the cases (60.03%, n = 4783) were aged 55 years or older, while 39.96% (n = 2217) were below 55 years of age. The prevalence of symptoms varied significantly among the COPD cases.

Shortness of breath was the most commonly reported symptom, affecting 84.93% (n = 5945) of patients. Dry cough was present in 69.15% (n = 4841), followed by sputum production in 61.15% (n = 4281). Fatigability was noted in 31.15% (n = 2180), while chest discomfort was the least reported symptom, occurring in 12.83% (n = 898) of cases.

Risk factors associated with COPD

Several risk factors were identified among the COPD cases. A history of smoking was reported by 13.40% (n = 938) of the participants. An additional 6.80% (n = 476) had exposure to both smoking and biomass fuel, highlighting the combined risk. However, the most significant contributor was biomass fuel exposure alone, which accounted for 47.80% (n = 3346) of cases. Additionally, 32.00% (n = 2240) of patients were exposed to agricultural dust or worked in dusty environments, further exacerbating respiratory conditions (Fig. 1).

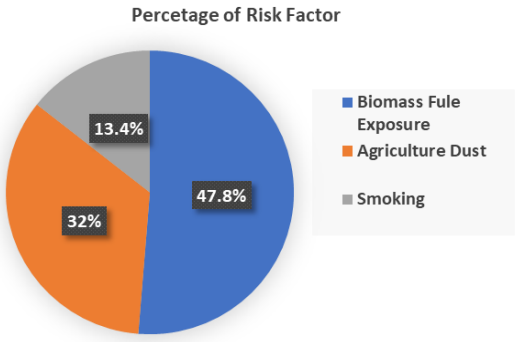

Fig. 1. Showing the percentage of risk factor distribution in COPD cases

Exacerbation history and GOLD staging

Exacerbation history was categorized based on severity and hospitalization requirement. Among the 7,000 cases, 41.15% (n = 2881) reported 0-1 exacerbation that did not require hospitalization, while 58.85% (n = 4119) experienced two or more exacerbations, including at least one requiring hospitalization. Based on the Global Initiative for Chronic Obstructive Lung Disease (GOLD) staging system, COPD severity varied among the cases. Stage 1 (mild COPD) was diagnosed in 10.15% (n = 711) of patients. Stage 2 (moderate COPD) was the most prevalent category, affecting 34.85% (n = 2439) of cases. Severe COPD (Stage 3) was present in 29.33% (n = 2053), while 25.66% (n = 1797) of the cases were classified as Stage 4, indicating very severe COPD (Fig. 2).

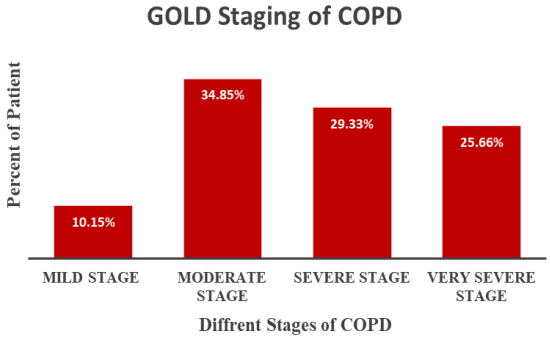

Fig. 2. Showing the percent of patient suffering from the different stages of COPD

Spirometry findings

All cases had an FEV_1/FVC ratio of less than 0.7, confirming airway obstruction. The distribution of FEV_1 values demonstrated varying levels of lung function impairment. A total of 14.85% (n = 1040) of cases had an FEV_1 of 80% or higher, indicating mild obstruction.

Moderate obstruction (FEV_1 between 50% and <80%) was noted in 30.15% (n = 2110) of cases. Severe obstruction (FEV_1 between 30% and <50%) was the most prevalent, affecting 35.15% (n = 2460), while 19.85% (n = 1390) of cases had an FEV_1 of less than 30%, indicating very severe impairment.

COPD awareness and acceptance

A striking observation in this study was the poor awareness and acceptance of COPD among the affected population. Only 3% (n = 210) of patients were aware that they had COPD prior to diagnosis. Additionally, 54% (n = 3780) had no knowledge of COPD as a disease, and 43% (n = 3010) refused to accept their diagnosis despite clinical confirmation ($p < 0.0001$).

This lack of awareness and acceptance poses significant challenges in disease management and treatment adherence (Fig. 3).

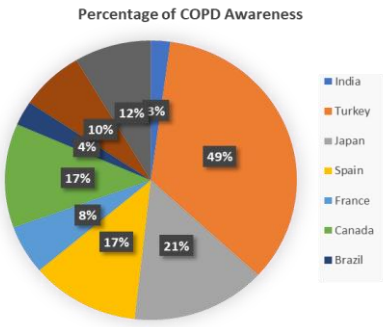

Fig. 3. Showing the percentage of COPD awareness of different countries

Treatment utilization and patterns

The study also analysed treatment patterns and the utilization of inhalation therapy versus oral medication. Among the COPD cases, 58% (n = 4060) received inhalation therapy as a primary mode of treatment. Of these, 31% (n = 2170) used levosalbutamol monotherapy, while 18% (n=1260) were prescribed a combination of levosalbutamol and beclometasone. A smaller subset, 9% (n = 630), used a combination of formoterol with budesonide or salmeterol with fluticasone, with or without tiotropium ($p < 0.0001$). Despite the effectiveness of inhalation therapy, 42% (n = 2940) of COPD cases relied solely on oral medications. Among these, 16% (n = 1120) used theophylline, 7% (n = 490) used salbutamol, and 19% (n = 1330) relied on oral steroids, which have well-documented side effects in long-term use ($p < 0.0001$). These findings underscore the significant disparity in treatment approaches and the suboptimal utilization of inhalation therapy (Fig. 4).

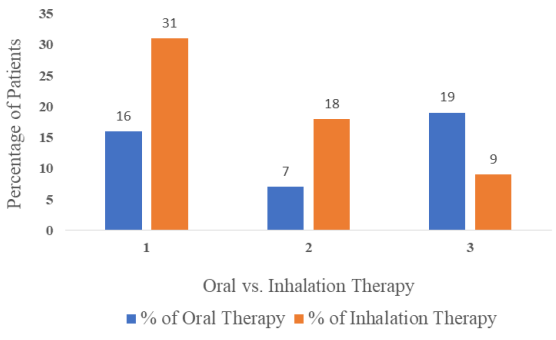

Fig. 4. Treatment utilization and patterns

Challenges in COPD management

The study identified three key challenges in COPD management, leading to the classification of patients and physicians into distinct categories. First, 43% (n = 3010) of the patients refused to accept their COPD diagnosis, which significantly hindered treatment adherence.

These individuals were labelled as "Difficult Patients." Second, 91% (n = 6370) of cases did not receive appropriate inhalation therapy due to financial constraints and were categorized under "Difficult Treatment." Finally, 42% (n = 2940) of cases were prescribed oral medications instead of inhalation therapy despite clinical guidelines recommending inhalers as the first-line treatment. This deviation from best practices led to the classification of these cases under "Difficult Doctor." These findings highlight systemic barriers in COPD treatment, including financial limitations, lack of awareness, and suboptimal prescribing patterns.

DISCUSSION

Sant Kabir Nagar, a district in northern India, is one of the 75 districts of Uttar Pradesh. It spans a total area of 1,646 square kilometres and has a population of 1,715,183, according to the 2011 census. This population size is comparable to that of The Gambia or the U.S. state of Nebraska. With a population density of 1,041 inhabitants per square kilometre, the district has seen a growth rate of 20.71% over the decade from 2010 to 2021. It is bordered by Gorakhpur to the east, Basti to the west, Siddharth Nagar to the north, and Ambedkar Nagar to the south (Tripathi *et al.*, 2023a; Tripathi *et al.*, 2023b). Despite its growing population, healthcare accessibility remains a challenge, particularly in managing chronic diseases such as Chronic Obstructive Pulmonary Disease (COPD). The limited availability of diagnostic tools, lack of awareness, and misconceptions about treatment contribute to the underdiagnosis and undertreatment of COPD in rural settings.

COPD is a progressive lung disease that significantly impacts the quality of life, particularly in Khalilabad, Sant Kabir Nagar, where the burden of respiratory illnesses is high. Despite being a leading cause of morbidity and mortality, COPD remains largely unrecognized among patients and even healthcare providers. The study revealed that only 3% of patients

were aware of their condition, while 54% had no knowledge of the disease, and 43% refused to accept their diagnosis. This lack of awareness leads to delays in seeking medical attention, allowing the disease to progress unchecked. Many physicians in rural areas rely solely on symptom-based diagnosis rather than objective methods like spirometry, further contributing to underdiagnosis. Comparatively, COPD awareness is significantly higher in other countries, with 49% awareness in Turkey, 21% in Japan, 17% in Spain, 8% in France, 17% in Canada, 4% in Brazile, 10% in Germany and 12% in Koria[12]. The stark difference highlights the urgent need for education and awareness campaigns to improve early detection and management of COPD in India's rural communities.

This study analysed data from 7,000 patients, of whom 68.33% were male and 31.66% were female. While COPD is often associated with smoking, the study found that in Khalilabad, Sant Kabir Nagar, smoking was a contributing factor in only 13.4% of cases—far lower than in Western countries. Instead, biomass fuel exposure was the leading risk factor, accounting for 47.8% of cases, followed by agricultural dust and pollution at 32%. In rural households, the widespread use of biomass fuels for cooking and heating exposes individuals, particularly women, to harmful smoke, leading to chronic respiratory diseases. Additionally, agricultural workers face prolonged exposure to dust and chemical pollutants, increasing their risk of developing COPD. The study also observed a significant correlation between eosinophilia in blood and sputum samples, which influenced the preference for LABA-ICS therapy over LAMA-LABA treatment in these patients (Global Initiative for Chronic Obstructive Lung Disease, 2019).

Globally, inhalation therapy is the preferred treatment for COPD, as it delivers medication directly to the lungs, providing effective symptom management and better long-term outcomes (Yawn *et al.*, 2007; Tinkelman *et al.*, 2006). However, inhaler use remains extremely low in Khalilabad, Sant Kabir Nagar. The study found that only 9% of patients received optimal long-acting bronchodilator therapy, largely due to high costs, lack of awareness, and misconceptions. Many patients believe that inhalers weaken the lungs or cause dependency, leading to reluctance in accepting inhalation therapy as a long-term treatment. Additionally, a lack of proper training among healthcare providers on inhaler techniques has further hindered their widespread adoption.

Due to financial constraints and limited access to inhalation therapy, 42% of patients relied on oral medications instead. Oral treatments were preferred because of their affordability, availability, and misconceptions about inhalers. Some patients believed that inhalers should only be used in emergencies, while others feared side effects such as throat irritation and speech alteration. Furthermore, doctors in rural areas often prescribed oral medications over inhalers due to concerns about patient adherence and cost-effectiveness. Many doctors found it easier to prescribe tablets, particularly to patients who were hesitant about inhalation therapy. The reliance on oral medications is concerning because inhalers have been proven to be more effective in managing COPD symptoms, preventing exacerbations, and improving overall quality of life.

One of the significant challenges in COPD management is what the study describes as the "Difficult Doctor, Difficult Patient, and Difficult Treatment" phenomenon (Gupta *et al.*, 2013). Many patients have strong misconceptions about inhalers, believing they cause dependency or lead to severe side effects such as urinary retention and throat infections. As a result, these patients refuse to use inhalers, making effective disease management difficult. The high cost of long-acting bronchodilators and inhaled corticosteroids further limits accessibility, forcing many patients to rely on short-acting inhalers, which provide only temporary relief. Additionally, some physicians in rural areas prefer prescribing oral medications due to cost concerns, ease of administration, and patient compliance. A lack of formal training in spirometry and evidence-based COPD management further contributes to this trend, leading to suboptimal treatment strategies. Addressing these challenges requires a multi-pronged

approach, including patient education, physician training, and cost-reduction initiatives (Buffels *et al.*, 2004).

Several key observations emerged from the study regarding COPD management in Khalilabad, Sant Kabir Nagar. Approximately 45% of patients classified as having milder COPD (Groups A and B) and 55% with severe COPD (Groups C and D) received inhalers.

However, despite experiencing multiple exacerbations, 58.85% of patients were not on appropriate inhalation therapy. Additionally, 14.85% of patients were diagnosed early using spirometry but lacked awareness about their condition and the benefits of early treatment intervention. These findings highlight the urgent need for proactive measures to improve COPD care through education, early diagnosis, and better access to effective treatments.

To bridge the gap in COPD awareness and treatment, several key recommendations should be implemented. Firstly, nationwide awareness campaigns should be launched using digital and social media platforms to educate both patients and healthcare providers about COPD.

Community-based programs emphasizing early diagnosis and the benefits of inhalation therapy can play a crucial role in improving patient outcomes. Secondly, regular spirometry training should be provided for general physicians to ensure accurate diagnosis and adherence to evidence-based treatment protocols. Thirdly, government-led initiatives should be introduced to promote the use of inhalers. Public health campaigns with slogans such as "Inhalers prevent lung attacks," "Inhalers improve quality of life," and "Inhalers reduce hospitalizations and overall treatment costs" can help dispel myths surrounding inhalation therapy and encourage wider adoption. Lastly, financial support programs should be considered to make inhalation therapy more accessible to economically disadvantaged patients. Subsidies and price reductions on inhalers can significantly enhance treatment adherence and overall COPD management in rural settings.

This study underscores the critical gap in COPD awareness, diagnosis, and treatment in Khalilabad, Sant Kabir Nagar. The lack of coordination between doctors, patients, and treatment options has led to widespread underdiagnosis and suboptimal care. To improve COPD management, routine spirometry should be integrated into primary healthcare services to facilitate early detection and intervention (Cazzola *et al.*, 2018; Eaton *et al.*, 1999). Additionally, training programs for family physicians should be prioritized to ensure that they follow standardized guidelines and best practices in COPD treatment. Encouraging a shift toward inhalation therapy is essential for better long-term outcomes and reduced hospitalization rates. Addressing financial barriers through government subsidies and increasing awareness through targeted educational campaigns will be instrumental in transforming COPD care in rural areas.

Given the growing burden of COPD in Khalilabad, Sant Kabir Nagar, immediate action is necessary to enhance disease awareness and optimize treatment strategies. Healthcare authorities, policymakers, and medical professionals must work together to "hype" awareness and educate rural populations on the benefits of rational inhalation therapy. By addressing the challenges associated with the "Difficult Doctor, Difficult Patient, and Difficult Treatment" phenomenon, substantial improvements in COPD management can be achieved. These efforts will not only improve health outcomes but also enhance the overall quality of life for individuals affected by COPD in underserved communities.

This study provides a comprehensive overview of COPD prevalence, risk factors, symptomatology, and treatment practices in a rural setting. The high burden of biomass fuel exposure, agricultural dust, and smoking underscores the need for targeted interventions to reduce environmental risk factors. Poor awareness and reluctance to accept a COPD diagnosis remain significant challenges, necessitating enhanced patient education and community-based screening programs. The disparity in treatment

utilization, particularly the underuse of inhalation therapy, highlights the urgent need for policy interventions to improve access to cost-effective, evidence-based treatments. Addressing financial barriers, increasing physician adherence to treatment guidelines, and strengthening patient education programs are critical steps in improving COPD management outcomes in rural populations. These findings emphasize the necessity of a multidisciplinary approach involving healthcare providers, policymakers, and community health initiatives to reduce the burden of COPD in resource-limited settings.

CONCLUSION

Chronic Obstructive Pulmonary Disease (COPD) remains a significant yet underdiagnosed health issue in Khalilabad, Sant Kabir Nagar, particularly in Sant Kabir Nagar. Despite its increasing prevalence, awareness among both patients and healthcare providers is alarmingly low. This study, based on data from 7,000 patients, revealed that only 3% were aware of their condition, while 54% had no knowledge of COPD and 43% refused to accept their diagnosis.

The lack of awareness, coupled with the limited use of diagnostic tools such as spirometry, has contributed to widespread underdiagnosis and delayed treatment. In contrast, COPD awareness in other countries such as Turkey (49%), Japan (21%), and Spain (17%) is significantly higher, highlighting the urgent need for awareness programs in India.

Unlike in Western countries where smoking is a primary cause of COPD, this study found that smoking contributed to only 13.4% of cases in Khalilabad, Sant Kabir Nagar. Instead, biomass fuel exposure (47.8%) and agricultural dust and pollution (32%) were the dominant risk factors. Women, in particular, are disproportionately affected due to prolonged exposure to indoor air pollution from cooking fuels. Agricultural workers also face increased risk due to inhalation of dust and chemicals. Addressing these environmental and occupational hazards through clean energy initiatives and workplace safety measures could help reduce COPD incidence in rural areas.

Treatment disparities remain a major challenge. Globally, inhalation therapy is the preferred treatment for COPD, as it delivers medication directly to the lungs for effective symptom control. However, inhaler usage is strikingly low in Khalilabad, Sant Kabir Nagar, with only 9% of patients receiving optimal bronchodilator therapy. The primary reasons for this include high costs, lack of awareness, and misconceptions about inhalers. Many patients believe inhalers weaken the lungs or cause dependency, leading to reluctance in accepting them as a long-term treatment. Additionally, healthcare providers in rural areas often lack proper training in inhaler techniques, further discouraging their use.

Due to financial constraints, 42% of patients relied on oral medications instead, despite their lower efficacy compared to inhalers. Many doctors also preferred prescribing oral treatments due to concerns about patient adherence and cost-effectiveness. This reliance on oral medications is concerning, as inhalers have been proven to provide better symptom control, prevent exacerbations, and improve overall quality of life. The study identified a significant correlation between eosinophilia in blood and sputum samples, influencing the preference for LABA-ICS therapy over LAMA-LABA treatment. However, due to affordability issues, long-acting bronchodilators remain underutilized, and short-acting inhalers are often used as a temporary solution.

The study highlights the "Difficult Doctor, Difficult Patient, and Difficult Treatment" phenomenon, where misconceptions about inhalers, high medication costs, and physician preferences for oral treatments hinder effective COPD management. Addressing these challenges requires a multi-faceted approach, including increased awareness, better access to diagnostic tools, and cost-effective treatment strategies.

To improve COPD care in Khalilabad, Sant Kabir Nagar, several key measures must be implemented. Nationwide awareness campaigns using digital media and community outreach programs can educate both patients and healthcare providers about the disease and its management. Regular spirometry training

should be introduced for general physicians to ensure accurate diagnosis and evidence-based treatment. Government-led initiatives should promote inhalation therapy through subsidies, price reductions, and public health campaigns emphasizing the benefits of inhalers. Slogans like "Inhalers prevent lung attacks," "Inhalers improve quality of life," and "Inhalers reduce hospitalizations and costs" can help dispel myths and encourage adoption.

This study underscores the urgent need to bridge the gap in COPD awareness, diagnosis, and treatment in Khalilabad, Sant Kabir Nagar. Routine spirometry should be integrated into primary healthcare services to enable early detection and intervention. Training programs for family physicians should be prioritized to ensure adherence to standardized COPD management guidelines. Encouraging a shift toward inhalation therapy is crucial for better long-term outcomes and reduced hospitalizations. Addressing financial barriers through government subsidies and increasing public awareness through targeted educational campaigns will be instrumental in transforming COPD care in rural settings.

Given the growing burden of COPD in India's rural communities, immediate action is necessary to enhance disease awareness and optimize treatment strategies. Healthcare authorities, policymakers, and medical professionals must collaborate to educate rural populations on the benefits of inhalation therapy. By tackling the challenges associated with the "Difficult Doctor, Difficult Patient, and Difficult Treatment" phenomenon, substantial improvements in COPD management can be achieved. These efforts will not only improve health outcomes but also enhance the overall quality of life for individuals suffering from COPD in underserved areas.

ACKNOWLEDGMENTS

I extend my sincere gratitude to the doctors of the Chest Diseases Department at the District Hospital and private hospitals in Khalilabad, Sant Kabir Nagar, for their invaluable support throughout the study. In particular, I am deeply thankful to Dr. Nagendra Prasad Mishra for his guidance and assistance during the entire research process. I also express my heartfelt appreciation to Prof. Brajesh Kumar Tripathi, Principal, H. R. P. G. College, for his valuable support and encouragement.

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