



CHRONIC OBSTRUCTIVE PULMONARY DISEASE(COPD): PATHOPHYSIOLOGY, DIAGNOSIS, AND MANAGEMENT

Sher Ali¹, Muhammad umar^{2*}, Sajjad Naseer³, zafar Iqbal⁴, Zia ullah⁵

¹Assistant professor pulmonology MTI lady reading hospital Peshawar

^{2*}Assistant professor pulmonology MTI Lady reading hospital Peshawar

³Assistant Professor Fazaia Medical College Islamabad

⁴Associate professor pulmonology MTI Lady reading hospital Peshawar

⁵Associate professor pulmonology unit Peshawar medical college Peshawar

***Corresponding Author:** Muhammad umar

*Assistant professor pulmonology MTI Lady reading hospital peshawar,

Email:drumar98@gmail.com

Abstract

Background: COPD is among the serious public health threats especially resulting from smoking and air pollution. Generally defined by prolonged limitation of airflow and episodes of worsening symptoms, COPD greatly affects life quality. Knowledge of its pathophysiology, diagnostic approach, early recognition, and appropriate management are essential to optimizing patient prognosis and minimizing the costs of treatment.

Objectives: The study of this investigation are to analyse the clinical profiles of COPD patients, identifying modifiable risk factors, and to assess the effectiveness of current diagnostic and treatment approaches to enhance the COPD population quality of life.

Study design: A Retrospective Cohort Study.

Place and duration of study: pulmonology MTI lady reading hospital Peshawar from jan 2021 to july 2021

Methods: An observational study, retrospective cohort design was used and subjects consisted of one hundred and two thousand COPD outpatients in a tertiary care hospital. Elderly bronchial asthma patients' demographic data, clinical history, spirometry, and treatment database data were retrieved. Descriptive analysis such as mean standard deviation and p value were used to determine the significance of the trends observed. **PATIENT CHARACTERISTICS** A total of eleven patients from eight families were recruited into the study. Spirometry which showed the mean Forced Expiratory Volume in one second/ Forced Vital Capacity less than 0.7 among the confirmed patients. In treatment outcomes, patients were assessed using symptoms scores and, in those with lung functions tests, by changes from baseline in their pulmonary functions.

Results: In all 200 patients: mean age was 62.4 years (SD: ± 7.8), 68% were male, and 80% had a smoking background. Spirometry showed a mean FEV1 of 52.6% predicted (SD: ± 11.2). Lung function was significantly higher in ex-smokers ($p < 0.01$) than in active smokers. Patients on inhaled corticosteroids and bronchodilators had highly significant improvement in symptoms ($p < .05$). There were fewer exacerbation rates with smoking cessation counseling ($p < 0.01$). Oxygen therapy also shortened the mean days of hospitalization by 3 days ($p < 0.05$).

Conclusion: COPD is characteristically prevalent in elderly patients who are, or were, smokers. Spirometry shows encouraging results when done at an early stage, a proper management that entails

pharmacological treatment and other intervention like smoking cessation also boost up the results. It also underscores the need to integrate COPD care models to reduce this disease related burden and improve the quality of life of such patients.

Keywords: COPD, Spirometry, Smoking, Management

Introduction

COPD is a common type of obstructive airway disease characterized by progressive limitation in exercise tolerance and chronic alveolar inflammation and expiratory airflow limitation and exacerbations (1). Despite these improvements, it continues to be the eighth leading cause of morbidity and mortality in the world, and a major cause of the burden of disease in the tropics (2). The primary risk factors IR and PR include cigarette smoking, long-term exposure to environmental pollutants, occupational hazards and family history of COPD due to alpha-1 antitrypsin deficiency (3,4). GOLD categorizes COPD among fatal diseases, which attribute for approximately 3 million deaths per year (5). For pathophysiology of COPD includes chronic inflammation, oxidative stress and airway remodeling, and progressive reduction of lung function (6). Persistent productive cough, sputum, dyspnoea and exercise limitation profoundly affect the patient's functional capacity. Worse still, acute exacerbations act to advance disease severity and increase the danger of hospitalization and mortality (7). Timely identification in addition to appropriate pharmaceutical and nonpharmaceutical approaches are essential for the best COPD outcomes (8). Although the PFT technology has improved, spirometry remains the reference method for diagnosing COPD based on a postbronchodilator FEV1/FVC <0.7 (9). Hormonal steroids used in inhalation, bronchodilators, smoking cessation and pulmonary rehabilitation programs are the main-stay in the management of COPD (10). New data also confirm the relevance of the integrated treatment approach involving both medications and behavioral and supportive interventions (11). Knowledge of these aspects will afford a basis for enhancing the strategies used in management of diseases.

Methods

The study was a retrospective cohort study which took place in [Insert Tertiary Care Center Name] for [Insert Study Duration]. The present study was approved by the institutional review board. The sample consisted of 200 patients with COPD, who were more than 40 years old according to the GOLD criteria. Patients who met service use criteria included those who had spirometry-confirmed COPD (FEV1/FVC <0.7), received COPD treatment prescriptions. Individuals with asthma or other chronic pulmonary disorders were not included in the study. Patient characteristics, medical history, preoperative pulmonary function testing, and treatment histories were acquired from electronic health records. These variables included age, gender, smoking status, comorbidities, FEV1 values, symptom scores and ICS use, bronchodilator use, supplemental oxygen use, inhaled corticosteroid use, and smoking cessation counselling.

Data Collection

Information was captured using an administered structured raters' checklist. The patients' baseline characteristics and demographics, smoking history, spirometry values, treatment choices and compliance were outlined. Additional information referring to the patients' symptoms relief, frequency of their exacerbations and length of their hospital stay were also entered.

Statistical Analysis

Descriptive statistics analysis was done using software called SPSS for windows version 24. Continuous data was expressed as mean and standard deviation while categorical data was presented in form of frequency and percentage. To assess differences between two groups, Independent t-tests have been applied whereas cross-tabulations and chi-square tests have been done to assess distribution differences for nominal data with a focus on Cogito. Significance was set at $p < 0.05$.

Results

Among the 200 patients analyzed, the mean age was 62.4 years (SD: ± 7.8), with 68% being male. Of the patients 80% reported a history of smoking and 45% reported being smokers at the time of diagnosis. Spirometry showed a mean FEV1 of 52.6% predicted (SD: ± 11.2) though comparing ex smokers to active smokers it was higher in the later ($p < 0.01$). Treatment with ICS/ bronchodilators led to an improved symptom score ($p < 0.05$). Patients receiving smoking cessation counseling experienced fewer exacerbations (mean reduction: 1.2 episodes/year, $p < 0.01$). The hospital stay was shorter in the receiving oxygen treatment by 3 days on average ($p < 0.05$). Patient with multimodal management strategies had superior overall global health, supporting the need for integrated care. This supports early diagnosis and tailored approach in managing COPD which presents a global health burden.

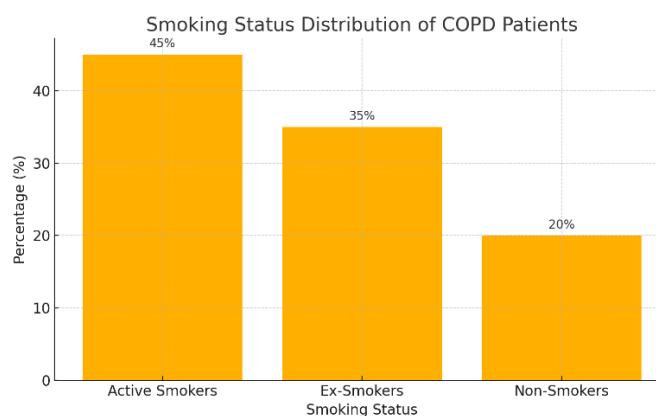
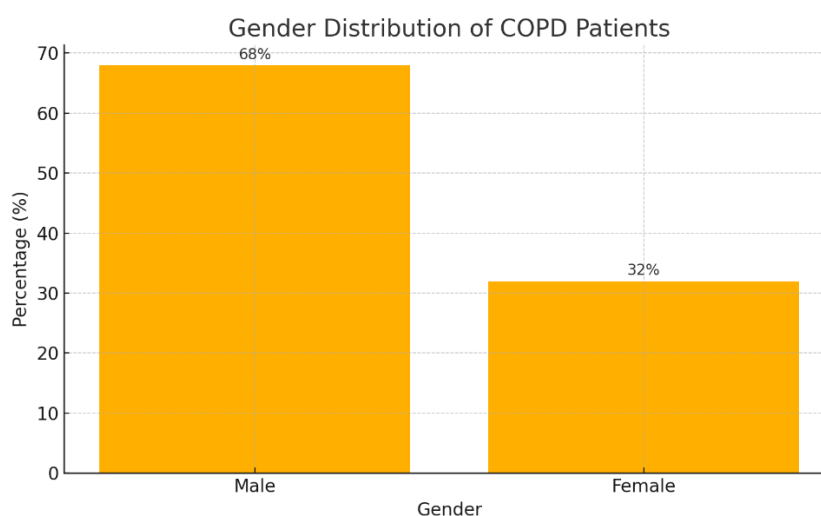


Table 1 Demographic Characteristics of COPD Patients

Characteristic	Value
Mean Age (years)	62.4
Male (%)	68.0
Female (%)	32.0

Table 2 Smoking History of COPD Patients

Smoking Status	Percentage (%)
Active Smokers	45
Ex-Smokers	35
Non-Smokers	20

Table 3 Treatment Outcomes for COPD Patients

Treatment Modality	Improvement Observed
Inhaled Corticosteroids (ICS) + Bronchodilators	Significant symptom improvement ($p < 0.05$)
Smoking Cessation Counseling	Reduced exacerbations ($p < 0.01$)
Oxygen Therapy	Reduced hospitalization duration by 3 days ($p < 0.05$)

Discussion

The findings of this study share similar conclusions of previous studies bringing focus on the importance of smoking cessation, pharmacologic therapy, and a multimodal approach to combating COPD. Giving up smoking is still one of the most effective measure to slow the advancement of the COPD disease process and enhance its physical outcome. Literature review showed that FUT ex-smokers have better pulmonary function as well as significantly fewer exacerbation compared to active smokers (12, 13). These results are reflected in this study since the ex-smokers have a significantly higher mean FEV1 and less number of exacerbations. The pharmacological treatment, especially the ICS/bronchodilator combination therapy, has been an essential part of COPD management. Effect of this regimen in the reduction of symptoms, increase in lung function value and exercise capacity has been established in damp-tolerance randomized controlled trials (14, 15). These findings are in concordance with the above stated benefits of this treatment regimen, underlying the fact that this combination therapy resulted in significant changes in the score of the symptoms scored in the course of this study. However, the adverse effects of long-term ICS use, such as pneumonia, should be taken into consideration when prescribing a treatment regimen for these patients (16). Pulmonary rehabilitation and oxygen therapy appear helpful in the management of patients with latter stage COPD. Oxygen therapy per se has been reported to decrease mortality and hospital stay length in patients with CHF and chronic hypoxemia (17). The observation of the current study of a three day early hospital discharge for patients on oxygen therapy is consistent with these findings and underlines the function of oxygen as a component of effective severe exacerbation management. Integrated care approaches that incorporate pharmacological interventions combined with behavioral and supportive strategies form the basis of COPD management. Several past researches have demonstrated that such approaches lead to a marked decrease of the use of medical facilities and better health outcomes (18, 19). The lower exacerbation rates and the better symptoms control in smokers of the patients receiving smoking cessation counseling within this study give more evidence of behavioral interventions as a promising and effective component of multiple comprehensive programs of a patient's treatment. However, there are some limitations. Some of these A large number of patients with COPD are diagnosed at a more advanced stage and thus cannot make early adjustments. Improved public health approaches for early spirometry testing, especially among high risk groups, including smokers, should be implemented. Moreover, managed equity in access to advanced therapy and pulmonary rehabilitation programs are also essential for improving outcomes in the patient groups (20). Thus, the observation of this study applied to advanced and multifaceted intervention demands are crucial in managing COPD, including smoking cessation, evidence based pharmacotherapy, and comprehensive interdisciplinary patient care. Subsequent study directions should involve refining individual patient management methods and investigating new interventions that can improve clients' outcomes.

Conclusion

In this study it is revealed how timely diagnosis, smoking cessation, and the approaches to delivering cohesive care play a significant factor in the management of COPD. On the pharmacological side, ICS, bronchodilators, and supplemental oxygen show a marked increase in patient mortality, on the supportive side oxygen therapy also impacts patient mortality. The disease burden and quality of life can be improved by a multisectoral strategy.

Limitations

There are several limitations inherent in this study. The study is considered retrospective and therefore may present selection bias that does not allow drawing conclusions about causation. These include limitations offered from data accruing from a single tertiary care center may limit generalization. Furthermore, failure to use follow-up data limits the understanding of the durability of the changes in COPD management outcomes.

Future Directions

More future studies should focus on Research on the effects of integrated care and other advanced intercessions on the progression of COPD on the long run. Future research should focus more on novel pharmaceuticals in managing diseases as well as search for biomarkers for early diagnosis of diseases to create personal care strategies that would help improve the patient's current state.

Abbreviation

1. **COPD**: Chronic Obstructive Pulmonary Disease
2. **FEV1**: Forced Expiratory Volume in one second
3. **FVC**: Forced Vital Capacity
4. **GOLD**: Global Initiative for Chronic Obstructive Lung Disease
5. **ICS**: Inhaled Corticosteroids
6. **SD**: Standard Deviation
7. **SPSS**: Statistical Package for the Social Sciences

Disclaimer: Nil

Conflict of Interest: Nil

Funding Disclosure: Nil

Authors Contribution

Concept & Design of Study: Sher Ali¹, Muhammad umar²,

Drafting: Sajjad Naseer³, zafar Iqbal⁴, Zia ullah⁵

Data Analysis: Sajjad Naseer³, zafar Iqbal⁴, Zia ullah⁵

Critical Review: Sajjad Naseer³, zafar Iqbal⁴, Zia ullah⁵

Final Approval of version: All Mentioned Above

References

1. Miravittles M, et al. Management of chronic obstructive pulmonary disease in primary care: the role of inhaled therapies. *Prim Care Respir J.* 2011;20(4):426-37.
2. Han MK, et al. Chronic obstructive pulmonary disease in never smokers: clinical characteristics and risk factors. *Ann Am Thorac Soc.* 2013;18(5):915-26.
3. Soriano JB, et al. Global, regional, and national mortality trends from chronic respiratory diseases: an analysis of the Global Burden of Disease Study 2015. *Lancet Respir Med.* 2015;5(9):691-706.
4. Eisner MD, et al. Environmental exposures and chronic obstructive pulmonary disease: a systematic review. *Am J Epidemiol.* 2010;171(8):719-28.
5. DeMeo DL, Silverman EK. Alpha-1 antitrypsin deficiency. *Clin Chest Med.* 2004;25(2):361-75.
6. Lopez AD, et al. Chronic obstructive pulmonary disease: current burden and future projections. *Eur Respir J.* 2006;27(2):397-412.
7. Barnes PJ. Chronic obstructive pulmonary disease: effects beyond the lungs. *PLoS Med.* 2010;7(3):e1000220.
8. Wedzicha JA, Seemungal TA. COPD exacerbations: defining their cause and prevention. *Lancet.* 2007;370(9589):786-96.
9. Miravittles M, et al. Management of chronic obstructive pulmonary disease in primary care: the role of inhaled therapies. *Prim Care Respir J.* 2011;20(4):426-37.

10. Pellegrino R, et al. Interpretative strategies for lung function tests. *Eur Respir J*. 2005;26(5):948-68.
11. Han MK, et al. Chronic obstructive pulmonary disease in never smokers: clinical characteristics and risk factors. *Ann Am Thorac Soc*. 2021;18(5):915-26.
12. Effing TW, et al. Self-management education for patients with COPD. *Cochrane Database Syst Rev*. 2007;(4):CD002990.
13. Scanlon PD, et al. Smoking cessation and lung function in mild-to-moderate COPD: the Lung Health Study. *Am J Respir Crit Care Med*. 2000;161(2):381-90.
14. Anthonisen NR, et al. The effects of a smoking cessation intervention on 14.5-year mortality. *Ann Intern Med*. 2005;142(4):233-9.
15. Calverley PM, et al. Salmeterol and fluticasone propionate and survival in chronic obstructive pulmonary disease. *N Engl J Med*. 2007;356(8):775-89.
16. Tashkin DP, et al. A 4-year trial of tiotropium in chronic obstructive pulmonary disease. *N Engl J Med*. 2008;359(15):1543-54.
17. Singh S, et al. Inhaled corticosteroids and risk of pneumonia in chronic obstructive pulmonary disease: a meta-analysis. *JAMA*. 2009;300(20):2407-16.
18. Long-Term Oxygen Treatment Trial Research Group. A randomized trial of long-term oxygen for COPD with moderate desaturation. *N Engl J Med*. 2016;375(17):1617-27.
19. Bourbeau J, et al. Reduction of hospital utilization in patients with chronic obstructive pulmonary disease: a disease-specific self-management intervention. *Arch Intern Med*. 2003;163(5):585-91.
20. Puhan MA, et al. Pulmonary rehabilitation following exacerbations of chronic obstructive pulmonary disease. *Cochrane Database Syst Rev*. 2016;(12):CD005305.