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Original Research

Clinico-Demographic Profile and Treatment Outcomes of Patients Admitted with Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) at a Tertiary Care Hospital.

Dr. Rajkumar Baranwal¹, Dr. Firoz Memon^{2*} 

¹Assistant Professor, Department of General Medicine, Krishna Mohan Medical College, Mathura, Uttar Pradesh, India.

²Associate Professor, Department of General Medicine, Saraswati Institute of Medical Sciences, Hapur, Uttar Pradesh, India.

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Abstract

Background: Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is one of the leading causes of hospitalization and mortality among patients with chronic respiratory diseases. Frequent exacerbations accelerate lung function decline, impair quality of life, and increase healthcare utilization. Understanding the clinico-demographic profile and treatment outcomes of hospitalized patients with AECOPD is essential for optimizing management strategies and reducing disease burden.(1,2) **Objectives:** To evaluate the clinico-demographic characteristics, clinical presentation, treatment modalities, and treatment outcomes of patients admitted with AECOPD at a tertiary care hospital. **Materials and Methods:** A hospital-based observational study was conducted among adult patients admitted with AECOPD over one year. Demographic characteristics, smoking history, comorbidities, clinical features, laboratory investigations, treatment received, duration of hospital stay, complications, and treatment outcomes were recorded using a structured proforma. Data were analyzed using descriptive and inferential statistics. A p-value <0.05 was considered statistically significant. **Results:** The majority of patients were elderly males with a significant history of tobacco smoking. Breathlessness and cough were the most common presenting symptoms. Hypertension and diabetes mellitus were the commonest comorbidities. Most patients responded well to standard therapy comprising bronchodilators, corticosteroids, antibiotics, and oxygen supplementation. Mechanical ventilation was required in a subset of patients with severe exacerbations. Overall clinical improvement was observed in most patients, while mortality remained low. **Conclusion:** AECOPD predominantly affects elderly smokers with multiple comorbidities. Early diagnosis, prompt treatment, smoking cessation, and appropriate management of associated illnesses significantly improve treatment outcomes and reduce hospital mortality.

Keywords: COPD, Acute exacerbation, Smoking, Treatment outcome, Hospitalization, Chronic obstructive pulmonary disease.

Introduction

Chronic obstructive pulmonary disease (COPD) is a progressive inflammatory disorder characterized by persistent airflow limitation resulting from chronic airway inflammation and destruction of lung parenchyma. It is one of the leading causes of morbidity and mortality worldwide and represents a significant public health challenge.(1) According to the Global Initiative for Chronic Obstructive Lung Disease (GOLD), COPD is currently among the top three causes of death globally and is responsible for nearly 3.5 million deaths annually.(1) The disease burden continues to rise due to increasing tobacco consumption, environmental pollution, occupational exposure, and population ageing.(2) India contributes substantially to the global burden of COPD owing to high rates of tobacco smoking, biomass fuel exposure, environmental pollution, and occupational hazards. The prevalence of COPD among Indian adults ranges from 4% to 10%, with higher rates reported among males and rural populations.(3,4) Acute exacerbation of COPD (AECOPD) is defined as an acute worsening of respiratory symptoms requiring additional therapy beyond routine maintenance treatment.(1) Exacerbations are usually precipitated by bacterial infections, viral infections, environmental pollutants, or poor treatment adherence.(5)

Address for Correspondence Dr. Firoz Memon, Associate Professor, Department of General Medicine, Saraswati Institute of Medical Sciences, Hapur, Uttar Pradesh, India.

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Patients with AECOPD commonly present with worsening breathlessness, increased cough, increased sputum production, and changes in sputum purulence. Severe exacerbations frequently require hospitalization and are associated with respiratory failure, prolonged hospital stay, increased healthcare costs, and higher mortality.(6) Repeated exacerbations accelerate the decline in pulmonary function and significantly impair quality of life. Patients experiencing two or more exacerbations annually have poorer long-term prognosis compared with stable COPD patients.(7) Smoking remains the most important modifiable risk factor for COPD. Approximately 80-90% of COPD cases are attributed to tobacco smoking. However, exposure to biomass smoke, indoor air pollution, occupational dust, and genetic susceptibility also contribute significantly, particularly in developing countries.(8) The management of AECOPD includes prompt administration of bronchodilators, systemic corticosteroids, antibiotics whenever indicated, oxygen therapy, non-invasive ventilation (NIV), invasive mechanical ventilation in selected cases, pulmonary rehabilitation, and smoking cessation counseling.(1,9) Several studies have demonstrated that older age, severe airflow obstruction, frequent exacerbations, poor nutritional status, cardiovascular diseases, diabetes mellitus, and delayed presentation are associated with adverse treatment outcomes.(10,11) Despite advances in medical therapy, hospitalization due to AECOPD remains associated with considerable morbidity and mortality. Understanding the demographic profile, clinical presentation, associated comorbidities, treatment patterns, and predictors of outcomes is essential for planning preventive and therapeutic strategies.(12) The present study was therefore undertaken to evaluate the clinico-demographic characteristics and treatment outcomes of patients admitted with AECOPD at a tertiary care teaching hospital.

Aim

To study the clinico-demographic profile and treatment outcomes of patients admitted with acute exacerbation of chronic obstructive pulmonary disease at a tertiary care hospital.

Objectives

1. To study the socio-demographic profile of patients admitted with AECOPD.
2. To evaluate the clinical presentation and associated comorbidities.
3. To assess laboratory and radiological findings.
4. To evaluate treatment modalities administered during hospitalization.
5. To determine treatment outcomes including duration of hospital stay, need for ventilatory support, complications, and mortality.

Materials and Methods

Study Design

Hospital-based prospective observational study.

Study Setting

Department of General Medicine, tertiary care teaching hospital.

Study Duration

One year.

Study Population

Patients admitted with acute exacerbation of COPD.

Inclusion Criteria

- Age ≥ 40 years.
- Previously diagnosed COPD or newly diagnosed COPD based on GOLD criteria.
- Admission with acute exacerbation requiring hospitalization.

Exclusion Criteria

- Bronchial asthma.
- Pulmonary tuberculosis.
- Bronchiectasis.
- Interstitial lung disease.
- Lung malignancy.
- Patients unwilling to participate.

Sample Size

A total of **100 consecutive eligible patients** were included using convenient sampling.

Data Collection

Data were collected using a predesigned case record form including:

- Age
- Gender
- Residence
- Smoking history
- Biomass exposure
- Occupational exposure
- Clinical symptoms
- Comorbidities
- Respiratory examination
- Chest radiography
- Arterial blood gas analysis
- Complete blood count
- Spirometry (previous records whenever available)
- Treatment administered
- Hospital stay
- Need for ICU admission
- Requirement of NIV/invasive ventilation
- Final outcome

Treatment Protocol

Patients received treatment according to GOLD recommendations including:

- Nebulized short-acting bronchodilators
- Intravenous/systemic corticosteroids
- Antibiotics when indicated
- Controlled oxygen therapy
- Methylxanthines where required
- Non-invasive ventilation
- Mechanical ventilation in severe respiratory failure
- Smoking cessation counseling before discharge.(1)

Statistical Analysis

Data were entered into Microsoft Excel and analyzed using SPSS software version 26. Continuous variables were expressed as mean $\pm$ standard deviation while categorical variables were expressed as frequencies and percentages. Chi-square test and Student's t-test were applied where appropriate. A p-value <0.05 was considered statistically significant.

Results

Among 100 patients included in the study, the mean age was 65.4 ± 9.8 years, with the majority (42%) belonging to the 61-70-year age group. Males constituted 72% of the study population, while females accounted for 28%.

A history of cigarette or bidi smoking was present in 78% of patients, whereas 22% reported exposure to biomass fuel smoke. Breathlessness (100%) was the most common presenting complaint, followed by cough (92%), sputum production (76%), fever (32%), wheezing (58%), and pedal edema (12%).

The most common comorbidities were hypertension (38%), diabetes mellitus (29%), ischemic heart disease (18%), chronic kidney disease (9%), and anemia (21%).

Chest radiography revealed hyperinflation in 70% of patients, while consolidation suggestive of pneumonia was observed in 18%. Arterial blood gas analysis demonstrated hypercapnic respiratory failure in 34% of cases.

All patients received bronchodilator nebulization and systemic corticosteroids. Antibiotics were administered to 82%, oxygen therapy to 90%, non-invasive ventilation to 28%, and invasive mechanical ventilation to 8% of patients.

The mean duration of hospital stay was 6.8 ± 2.9 days. Clinical improvement with discharge was achieved in 91% of patients, while 5% required referral to higher intensive care facilities and 4% died during hospitalization.

Discussion

Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) remains one of the most common causes of emergency hospital admissions among patients with chronic respiratory diseases. The present study evaluated the clinico-demographic characteristics, clinical presentation, management, and treatment outcomes of patients admitted with AECOPD at a tertiary care hospital. In the present study, the mean age of patients was 65.4 ± 9.8 years, with the majority belonging to the 61-70 years age group. This finding is comparable with studies conducted by Patel et al. and Bhowmik et al., who reported that COPD predominantly affects individuals older than 60 years due to cumulative exposure to tobacco smoke, biomass fuel, occupational pollutants, and age-related decline in pulmonary function.(13,14) Increasing age has consistently been recognized as an independent predictor of severe exacerbations, prolonged hospitalization, and mortality. A marked male predominance (72%) was observed in the present study. Similar observations have been reported by Salvi and Barnes, who attributed this finding to higher tobacco consumption and occupational exposure among males in developing countries.(3) However, recent epidemiological studies have demonstrated a gradual increase in COPD among women because of biomass fuel exposure and changing smoking habits.(2)

Smoking was identified as the most important risk factor, with 78% of patients reporting current or previous tobacco use. This observation is consistent with the GOLD 2025 report, which identifies cigarette smoking as the leading preventable cause of COPD worldwide.(1) Tobacco smoke induces chronic airway inflammation, oxidative stress, mucus hypersecretion, and progressive destruction of alveolar architecture, ultimately leading to irreversible airflow obstruction.(5) Among nonsmokers, exposure to biomass fuel smoke constituted an important etiological factor. Biomass exposure has emerged as a major contributor to COPD among women residing in rural areas of India due to prolonged exposure to indoor cooking smoke.(3,15) Breathlessness was the universal presenting symptom in the present study, followed by cough and sputum production. Similar symptom patterns have been described by Celli et al. and Wedzicha and Seemungal, who reported worsening dyspnea as the hallmark of acute exacerbation requiring hospitalization.(5,16) Hypertension and diabetes mellitus were the most common associated comorbidities in the present study. COPD is increasingly recognized as a multisystem inflammatory disorder associated with cardiovascular diseases, metabolic syndrome, osteoporosis, depression, and chronic kidney disease.(10) The coexistence of these conditions significantly influences prognosis, increases healthcare utilization, and complicates clinical management.

Hyperinflation was the commonest chest radiographic finding, while pneumonia was detected in nearly one-fifth of patients. Infective exacerbations remain the leading cause of hospitalization, with bacterial pathogens such as *Haemophilus influenzae*, *Streptococcus pneumoniae*, and *Moraxella catarrhalis* accounting for a substantial proportion of episodes.(6) Hypercapnic respiratory failure was documented in approximately one-third of patients, emphasizing the severity of illness among hospitalized individuals. Arterial blood gas analysis remains an essential investigation for assessing respiratory failure and guiding ventilatory support.(1) All patients received bronchodilator therapy and systemic corticosteroids in accordance with GOLD recommendations. Antibiotics were prescribed in patients with increased sputum purulence or suspected bacterial infection, while oxygen therapy was carefully titrated to maintain target oxygen saturation between 88% and 92%, thereby minimizing the risk of carbon dioxide retention.(1) Approximately 28% of patients required non-invasive ventilation (NIV), whereas only 8% required invasive mechanical ventilation. NIV has become the preferred ventilatory modality in AECOPD because it improves gas exchange, decreases work of breathing, reduces endotracheal intubation rates, shortens hospital stay, and lowers mortality.(17)

The mean duration of hospitalization in the present study was 6.8 days, which is comparable to previous Indian hospital-based studies reporting average hospital stays ranging from 5 to 8 days.(13,14) Factors contributing to prolonged hospitalization include advanced age, severe airflow limitation, respiratory failure, multiple comorbidities, and delayed initiation of treatment. A favorable clinical outcome was achieved in the majority of patients, with 91% showing improvement and being discharged. Hospital mortality was 4%, comparable to rates reported in tertiary care hospitals worldwide.(18) Mortality in AECOPD is largely associated with advanced disease severity, respiratory failure requiring invasive ventilation, cardiovascular complications, and recurrent exacerbations. Early recognition of exacerbation symptoms, smoking cessation, vaccination against influenza and pneumococcus, pulmonary rehabilitation, adherence to maintenance inhaled therapy, and regular follow-up have been shown to reduce future exacerbations and improve long-term survival.(1,19) The findings of the present study reinforce the importance of comprehensive management strategies focusing on risk factor modification, evidence-based pharmacotherapy, early ventilatory support when indicated, and management of associated comorbidities to improve patient outcomes.

Conclusion

Acute exacerbation of COPD predominantly affects elderly male smokers and remains an important cause of hospital admission. Breathlessness, cough, and sputum production were the most common presenting symptoms, while hypertension and diabetes mellitus were frequent comorbidities. Standard treatment comprising bronchodilators, corticosteroids, antibiotics, oxygen therapy, and ventilatory support resulted in favorable clinical outcomes in the majority of patients. Early diagnosis, prompt initiation of evidence-based treatment, smoking cessation, pulmonary rehabilitation, and optimal management of comorbid conditions are essential for reducing morbidity, preventing recurrent exacerbations, and improving survival.

Limitations

- This was a single-center hospital-based study, limiting the generalizability of the findings.
- The sample size was relatively small.
- Long-term follow-up after discharge was not performed.
- Spirometry during acute exacerbation could not be performed in all patients.
- Microbiological evaluation was not available for every patient.

Recommendations

- Strengthen smoking cessation programs and tobacco control measures.
- Promote early diagnosis through spirometry in high-risk individuals.
- Encourage influenza and pneumococcal vaccination.
- Improve adherence to maintenance inhaler therapy.
- Conduct multicentric prospective studies with larger sample sizes and long-term follow-up.
- Establish pulmonary rehabilitation services to reduce recurrent exacerbations and improve quality of life.

Conflict of Interest

Nil.

Source of Funding

Nil.

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