Section: Respiratory Medicine

Original Research Article

A STUDY ON SPUTUM BACTERIOLOGY AND ANTIBIOTIC SENSITIVITY PATTERN OF PATIENTS WITH ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN A TERTIARY CARE HOSPITAL

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a multisystem condition that mostly affects the lungs. Acute exacerbation of COPD (AECOPD) contributes to the disease's overall severity and irreversible progression. Bacterial infections are the leading cause of AECOPD in India, accounting for more than 40% of all exacerbations. The aim is to assess prevalence of bacterial exacerbations of COPD and detect type of bacteria causing AECOPD with its antibiotic sensitivity pattern. **Materials and Methods:** This is a hospital based observational descriptive cross sectional study carried out from January 2017 to June 2018, Department of Respiratory Medicine, Medical College Hospital, Kolkata. Total 105 patients were included in this study. **Result:** In our study smoking habit is not statistically significantly associated with severity of COPD. But it was strongly associated with COPD i.e., COPD is more common in smokers. It was observed that all cases of very severe COPD (100%) and most of the severe COPD (88.24%) developed in smokers and Klebsiella pneunoniae (38.46%), followed by Staphylococcus aureus (23.08%), Streptococcus species (15.39%), Pseudomonas aeruginosa (10.26%), E. coli (5.13%), Acinetobacter species (5.13%) and Enterobacter species (2.56%). **Conclusion:** Smoking habit was strongly and statistically significantly associated with COPD but statistically not significantly associated with severity of COPD and Most frequently isolated bacteria, Klebsiella pneumoniae was mostly sensitive to Piperacillin/tazobactum, Meropenem, Amikacin, Levofloxacin and Colistin.

INTRODUCTION

COPD (Chronic Obstructive Pulmonary Disease) is a multisystem disease that mostly affects the lungs.
According to the GOLD guideline, COPD is defined as a common, preventable and treatable disorder characterised by persistent respiratory symptoms and airflow limitation caused by airway and/or alveolar abnormalities caused by significant exposure to noxious particles or gases.[1]
COPD is a prominent source of illness and death around the world [2]. It is currently the fourth largest cause of death in the world and will rise to third by 2020. COPD caused around three million deaths worldwide in 2012, accounting for 6% of all deaths.[2]
This disease affects 4-10% of adult males in India and 3.5-6.5% of the population in Asia Pacific countries.[3]
According to the Burden of Obstructive Lung Diseases (BOLD) project, 384 million COPD cases were reported in 2010, with a global prevalence of 11.7% (95% confidence interval (CI) 8.4-15.0%).[4]
With rising smoking rates in low-income countries and an ageing population in high-income countries, the incidence of COPD is expected to rise over the next 30 years, with over 4.5 million deaths from COPD and related disorders by 2030.[5,6]
According to the Global Burden of Disease Study (GBDS), COPD is anticipated to ascend to the fifth place as the leading cause of disability adjusted life years (DALYs) loss by 2020. The greatest increase in tobacco- related mortality is expected in India, China and other Asian countries.[7]
According to a recent estimate in INDIA, chronic respiratory disease accounts for 7% of deaths and 3% of DALYs lost, with COPD accounting for the majority of these losses.[8]

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COPD morbidity calculated in disability adjusted life years was 690 per 100 000 population in 2004, according to World Health Organisation country data. In a country with a population of 1.25 billion people, this is quite likely. The age-standardized death rate of 64.7 per 100,000 population accounts for 20% of global COPD mortality (556 000 cases out of 2 748 000 cases) in a given year.[9]

MATERIALS AND METHODS

Type of Study: Hospital based observational descriptive study.
Study Design: Cross-sectional.
Study Setting: Within the premises of Medical College Hospital, Kolkata.
Place of Study: Department of Respiratory Medicine, Medical College Hospital, Kolkata.
Period of Study: January 2017 to June 2018.
Study Population: Patients with acute exacerbation of COPD admitted in Respiratory Medicine Department of Medical College Hospital, Kolkata.
Sample Size: About 105 patients have been taken from among the admitted COPD patients.
Study Technique: About 105 cases were selected from among admitted AECOPD patients after fulfilling inclusion and exclusion criteria. Data were collected using predesigned questionnaire after getting written informed consent and were analyzed statistically. Results obtained were compared with observations made elsewhere.

Inclusion Criteria

- Previously diagnosed patient of COPD on the basis of history of exposure to risk factors, clinical history and examination Supported by spirometric evidence of post bronchodilator FEV1/FVC <0.7 (GOLD criteria)
- Acute exacerbation of COPD according to the following criteria (Presence of any one of the following):
- Increased severity of dyspnoea
- Increased sputum volume
- Increased sputum purulence
- Increased cough
- Sputum sample contains <10 squamous epithelial cells/LPF and>25 neutrophils/LPF.

Exclusion Criteria

- Patients having concomitant bronchiectasis
- Patients having sputum positive for acid fast bacilli (AFB)
- Exacerbation due to pneumonia, pneumothorax, pleural effusion, cor-pulmonale, left ventricular failure and arrhythmia

RESULTS

Among the 63 participants, the prevalence of smoking habit varied across the severity categories. In the mild group, 71.43% were smokers, while 28.57% were non-smokers. In the moderate group, smokers constituted 67.86%, and non-smokers 32.14%. The proportion of smokers further increased in the severe group (88.24%), and all patients in the very severe group (100%) were smokers. Overall, 76.19% of the participants were smokers. However, the association between smoking habit and severity category was not statistically significant ($p = 0.6960$). Out of 25 COPD patients, 8 (32%) had a severity score in the range of 1–300, while 17 (68%) had scores greater than 301. Among those with scores between 1–300, the majority (75%) were in the moderate category, while 25% were mild. In contrast, among those with scores >301, 41.18% each belonged to the moderate and severe categories, and 17.65% were very severe. Notably, no cases of severe or very severe COPD were observed in the 1–300 group. A statistically significant association was found between the severity of COPD and score group ($p = 0.0173$).

The distribution of COPD severity showed a progressive increase in mean scores with worsening disease. Patients with mild COPD (n=28) had a mean score of 14.43 ± 3.36, ranging from 8 to 24, with a median of 14.5. Those with moderate COPD (n=50) had a higher mean score of 19.82 ± 5.67 (range: 0–34; median: 20). Severe cases (n=21) showed a mean of 29.71 ± 3.41, with scores ranging from 22 to 35 and a median of 30. Patients classified as very severe (n=6) had the highest mean score of 33.5 ± 2.51 (range: 30–36; median: 33.5). The difference in mean scores across the severity groups was statistically highly significant ($p < 0.0001$).

Table 1: Association of smoking habit with severity of background COPD in male patients (n = 63)

Smoking habit	Mild	Moderate	Severe	Very severe	Total	p-value
Yes	10 (71.43)	19 (67.86)	15 (88.24)	4 (100.00)	48 (76.19)	0.6960
No	4 (28.57)	9 (32.14)	2 (11.76)	0	15 (23.81)	
Total	14 (100.00)	28 (100.00)	17 (100.00)	4 (100.00)	63 (100.00)	

Table 2: Association of severity of background COPD with smoking index (n=25).

Severity of COPD	1-300	>301	Total	p-value
Mild	2 (25.00)	0	2 (8.00)	0.0173
Moderate	6 (75.00)	7 (41.18)	13 (52.00)	
Severe	0	7 (41.18)	7 (28.00)	
Very severe	0	3 (17.65)	3 (12)	
Total	8 (100.00)	17 (100.00)	25 (100.00)	

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Table 3: Association of mean CAT score with severity of background COPD (n=105)

Severity of COPD	No. of COPD patients	Mean	SD	Minimum	Maximum	Median	p-value
Mild	28	14.43	3.3602	8	24	14.5	<0.0001
Moderate	50	19.82	5.6666	0	34	20	
Severe	21	29.71	3.408	22	35	30	
Very severe	6	33.5	2.51	30	36	33.5	

DISCUSSION

The present study demonstrated a progressive increase in mean scores corresponding to the severity of COPD, with statistically significant differences across severity groups ($p < 0.0001$). This trend aligns with the pathophysiological understanding that worsening COPD is associated with greater symptom burden and decreased pulmonary function. The mean score in mild cases was 14.43 ± 3.36, which increased to 19.82 ± 5.67 in moderate, 29.71 ± 3.41 in severe, and 33.5 ± 2.51 in very severe cases. These findings are consistent with those reported by Mahesh et al., who observed similar gradation of severity among COPD patients based on symptom scores and spirometric classification, where mean scores escalated significantly with disease progression ($p < 0.001$).[10] Additionally, our study identified a significant association between severity score groups (1–300 vs >301) and COPD severity categories ($p = 0.0173$), with severe and very severe COPD being exclusively associated with higher scores. This supports the clinical utility of symptom scoring systems in stratifying patients for appropriate management strategies. Although a high prevalence of smoking was observed across all severity levels—ranging from 71.43% in mild to 100% in very severe—the association between smoking and COPD severity was not statistically significant ($p = 0.6960$). This is in contrast to the findings of Jindal et al., who reported a strong association between smoking index and COPD severity ($p < 0.05$), suggesting possible regional, genetic, or sample size-related differences.[11] Nevertheless, the high prevalence of smoking among COPD patients underscores the importance of robust smoking cessation interventions, regardless of statistical significance.

CONCLUSION

We conclude that, a high prevalence of smoking among COPD patients across all severity categories, with an increasing trend noted in more severe forms of the disease. However, this association was not statistically significant. A significant correlation was observed between COPD severity and score ranges, indicating that higher scores were associated with more severe disease. Additionally, the mean score showed a consistent and statistically significant rise with increasing COPD severity, highlighting the utility of score-based classification in reflecting disease progression.

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