

Microbial Pattern in Acute Exacerbation of COPD and its Relevance to COPD Severity

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Abstract

Background: COPD is a major cause of morbidity and mortality throughout the world. Many people suffer from this disease for years, and die prematurely from it or its complications. Exacerbations and hospitalizations in particular constitute the most important direct health related costs associated with COPD. Infections, both viral and bacterial cause exacerbations. During exacerbations there is either increase in bacterial load or acquisition of new strains. The present study was planned to analyze the microbial pattern among COPD patients during exacerbations and their relation to COPD severity.

Objectives

1. To determine the sputum microbial pattern in patients with acute exacerbation of COPD.
2. To compare the grouping of COPD patients by Combined COPD risk assessment method using COPD assessment test (CAT) vs Modified Medical Research Council (mMRC) and severity grades vs Past year exacerbations each separately.

Methods: This is a cross sectional study done at Department of Pulmonary Medicine, Government Medical College, Trivandrum from November 2015–November 2016 among patients admitted with acute exacerbation of COPD. 89 patients were included in this study. Sputum was sent for culture and sensitivity. History of past year exacerbations and spirometry values were noted and COPD was grouped using Combined COPD assessment method using mMRC, CAT score, severity grades and past year exacerbations separately. Data was analysed using SPSS v16.

Results: Of the 89 subjects, microbial isolates were seen in 34.7% cases. Pseudomonas was the predominant isolate in 10.1% of the cases. Tuberculosis was diagnosed in 6.7% cases who presented with acute exacerbation. Using CAT score, 92.6% were categorised into risk groups B and D with a high impact of symptoms than using mMRC (74.7%). Based on severity grades, 72% patients had a high exacerbation risk compared to the use of past-year exacerbations (30.4%).

Conclusions: Pseudomonas aeruginosa was predominantly isolated from COPD exacerbation patients. Classifying COPD patients into risk groups A–D, using either CAT/ mMRC and severity grades, past-year exacerbations do not provide comparable results as using them individually.

Exacerbations and hospitalizations, in particular, constitute the most important direct health related costs associated with COPD.³ Often, the prevalence of COPD is directly related to the prevalence of tobacco smoking, although in many countries, outdoor occupational and indoor air pollution – the latter resulting from the burning of wood and other biomass fuels – are major COPD risk factors.⁴

There is gathering evidence that exacerbations accelerate the progressive decline in lung function in COPD patients, making their prevention even more important.⁵ In general, exacerbation frequency increases with disease severity, as represented by airflow obstruction.

Infections, both viral and bacterial cause exacerbations. Bronchoscopic studies have shown colonization of lower airways in 20% of stable COPD patients. During exacerbations there is either increase in bacterial load or acquisition of new strains. Hence the present study was planned to study the microbial pattern among the COPD patients during exacerbations and their relation to COPD severity.

Objectives

1. To determine the microbial pattern in patients with acute exacerbation of COPD.
2. To compare the grouping of COPD patients by Combined COPD risk assessment method using,

*COPD assessment test (CAT) / Modified Medical Research Council (mMRC) and

*Severity grades/Past year exacerbations, each separately.

Introduction

Chronic Obstructive Pulmonary Disease (COPD), the third leading cause of death in the world, represents an important public health challenge that is both preventable and treatable.¹ WHO predicts that COPD will become the fourth leading cause of death worldwide by 2030.² COPD

is a major cause of chronic morbidity and mortality throughout the world. Many people suffer from this disease for years, and die prematurely from it or its complications.

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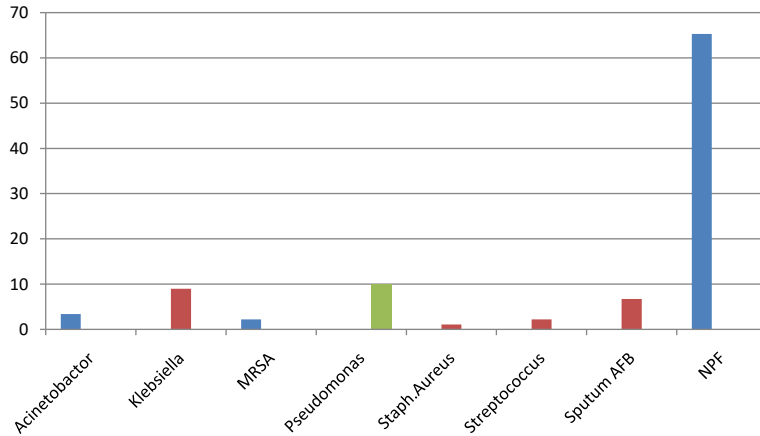


Fig. 1: Distribution of microbial isolates in sputum

Material and Methods

This is a cross sectional study done at Department of Pulmonary Medicine, Government Medical College, Trivandrum from November 2015- November 2016 among patients admitted with acute exacerbation of COPD in the Department of Pulmonary Medicine, Government Medical College, Trivandrum.

89 patients admitted with acute exacerbation during that period were taken for study. Sputum was sent for culture and sensitivity. History of past year exacerbations and spirometry values were noted and COPD was grouped using Combined COPD assessment method using mMRC, CAT score, severity grades and past year exacerbations separately. Data was analysed using SPSS v16.

Results

The age in the cases varied from 45-80 years (66.5±/ 8.5). 61.8% of patients were above 60yrs. Out of 89 patients, 73(79.8%) were males and 16(20.2%) were females. 79.8% were smokers out of which 27% were current smokers and 52.8% were ex-smokers. All females in our study were non smokers. Mean smoking index was 871.8±544.8. Passive smoking was seen in all the females and biomass fuel exposure (firewood smoke exposure) was present in 25.8% cases. Occupational exposure (tea shop workers exposed to fire wood smoke) was seen in 10.1% cases. 73% of the patients had grade 2/3 mMRC dyspnoea and all the patients had worsening of dyspnoea at the time of admission. Mean FEV1 was 1.03± 0.41. 68.5 % patients belonged to GOLD 3 or

4 severity of grading.

Of the 89 subjects, microbial isolates were seen in 34.7% cases. Pseudomonas was the predominant isolate in 10.1% of the total cases. Tuberculosis was diagnosed in 6.7% cases who presented with acute exacerbation (Figure 1).

In the second part of our study, comparison between grouping of COPD patients based on

Combined COPD Risk Assessment method using

COPD assessment test (CAT) / Modified Medical Research Council (mMRC) and

Severity grades / Past-year exacerbations were done separately and compared.

Using CAT, more patients (92.6%) were categorised into risk groups B and D with a high impact of symptoms than using mMRC(74.7%). Based on severity grades, 72% patients had a high exacerbation risk compared to the use of past-year exacerbations (30.4%).

To test the inter rater agreement between the four combinations of grouping of COPD patients, Cohen's Kappa was calculated.

Inter rater agreement was tested and the results were,

Between CAT and mMRC ($\kappa = 0.554$) moderate

Between severity grades and past-year exacerbations ($\kappa = 0.21$) fair.

Discussion

The use of antibiotics in COPD exacerbations is controversial⁽⁶⁾. There is evidence supporting the use of antibiotics in exacerbations of COPD in patients having clinical suspicion of

infection such as sputum purulence.⁷ Antibiotics should be given for patients with three cardinal symptoms i.e., increase in breathlessness, increase in sputum volume, sputum purulence or any of the symptoms were sputum purulence is one of the symptoms and those going for mechanical ventilation. The recommended duration of antibiotics is 5-10 days. In patients with frequent exacerbations or severe airflow limitation, sputum culture should be sent as gram negative organisms like pseudomonas aeruginosa is common and higher antibiotics are indicated. In our study, we observed predominantly isolates of Pseudomonas. 10.1% of patients in our cohort showed positive culture to pseudomonas. Similar study done by Chawla et al also showed Pseudomonas in 25.95% cases.⁸

In an Indian study done by Anand K Patel et al in Gujarat in 2011-2012, Streptococcus pneumonia was found to be the commonest pathogen.⁹ But still Pseudomonas was isolated from 14.7% cases which was comparable to our study results. Pseudomonas was predominantly found among those patients with severe and very severe obstruction.

Klebsiella pneumonia was found as the predominant isolate in study by Madhvi et al.¹⁰ Few authors have found higher incidence of Pseudomonas and Enterobacteriaceae. Groenwegan et al, in his study on more severe COPD patients, found H. influenza as the most common pathogen.¹¹ However data on relationship between organisms and COPD severity (lung function) is scarce.

In our study, using CAT, more patients (92.6%) were categorised into risk groups B and D with a high impact of symptoms than using mMRC (74.7%). Since CAT and mMRC do not provide the same COPD risk group classifications, it may be preferable to restrict to one symptom assessment tool. While CAT assesses the general health status of COPD, mMRC was developed to measure dyspnea. A CAT score ≥ 10 has been shown to have a significant impact on daily life in patients with COPD. Furthermore, patients with a CAT score ≥ 10 are likely to have breathlessness on most days and get exhausted easily. Due to its comprehensiveness, CAT scoring may be preferred for classifying patients into COPD risk groups A-D.

Based on severity grades, 72% patients had a high exacerbation risk compared to the use of past-year exacerbations (30.4%), when classifying patients into COPD risk groups A-D. Despite the clear definition of an exacerbation, it is still difficult to ensure a correct recording of the exacerbation history. On the contrary, spirometry based severity grades are objective and reliable. The direct comparison of these two risk assessments might be difficult and could explain the discrepancy between them. Due to a higher validity and reliability, spirometry-based severity grades may be preferred for COPD classification into risk groups A-D.

The new GOLD guidelines propose specific therapy according to risk group classifications. Misclassification due to the use of different tools could lead to inconsistent management and treatment of the affected severe COPD patients. Therefore, it might be advantageous to use only one tool to assess symptoms and exacerbation risk.

Conclusion

Pseudomonas aeruginosa was predominantly isolated from groups C and D, emphasizing the need for higher antibiotics in COPD exacerbations in these groups. Tuberculosis was diagnosed in 6.7% cases who presented with acute exacerbation emphasizing pulmonary tuberculosis be ruled out in all cases of COPD exacerbations. Also, classifying COPD patients into risk groups A-D, using either CAT/ mMRC and severity grades, past-year exacerbations do not provide comparable results as using them individually. This may warrant variations in therapy within each group.

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