

## A Study of Spectrum of Organisms and Their Sensitivity Pattern in Patients Presenting with Acute Exacerbation of Chronic Obstructive Pulmonary Disease

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### Article History

Received: 28.08.2017

Accepted: 05.09.2017

Published: 30.09.2017



**Abstract:** Chronic obstructive pulmonary disease is preventable and treatable disease. COPD is the fourth leading cause of death and affects >10 million persons in the United States. COPD is also a disease of increasing public health importance around the world. Estimates suggest that COPD will rise from the sixth to the third most common cause of death worldwide by 2020. In India, COPD is the second most common lung disorder next to pulmonary tuberculosis. Exacerbations of COPD cause morbidity, repeated hospitalization and mortality, infection of respiratory tract is the most important cause for acute exacerbation, hence spectrum of organisms causing exacerbation is evaluated in our study. To determine spectrum of organisms in patients admitted with acute exacerbation of COPD in our hospital. We conducted a cross-sectional study in 50 patients with COPD. Spectrum of organisms causing acute exacerbation was analyzed in our study. Out of 50 patients studied, age distribution among the patients with acute exacerbation of COPD was maximum between 51-60 yrs, male more than female (82% vs 18%). Sputum examination showed normal commensals in 66%, Klebsiella in 22% and E-Coli in 12% of patients.

**Keywords:** COPD, pulmonary tuberculosis, Sputum examination, Klebsiella

### INTRODUCTION

Chronic obstructive pulmonary disease is preventable and treatable disease. The Global Initiative for Chronic Obstructive Lung Disease (GOLD) defines COPD as

a disease state characterised by progressive development of chronic airflow limitation that is not fully reversible and includes chronic bronchitis, emphysema and small airway disease. Chronic bronchitis is characterised by chronic cough with expectoration for at least 3 months of the year for more than 2 consecutive years. Emphysema is defined as the permanent, abnormal distension of air spaces distal to the terminal bronchioles, accompanied by destruction of their walls without fibrosis [1].

COPD is the fourth leading cause of death and affects >10 million persons in the United States. COPD is also a disease of increasing public health importance around the world. Estimates suggest that COPD will rise from the sixth to the third most common cause of death worldwide by 2020 [2].

In India, COPD is the second most common lung disorder next to pulmonary tuberculosis. According to 2006 WHO estimates of deaths and disability adjusted life years attributable to COPD in India, age adjusted deaths/100000 is 73.2; age adjusted DALYs/100000 is 667 [3]. COPD affects 30% of cases

seen in chest clinics and accounts for 25% of hospital admissions all over India.

Exacerbations of COPD cause morbidity, repeated hospitalization and mortality and strongly influence health-related quality of life [4]. About half of COPD exacerbations are caused or triggered by bacterial infections. Type 1 exacerbation involve increased dyspnea, sputum volume and sputum purulence; type 2 involve any two of the latter symptoms; type 3 involve one of those symptoms combined with cough, wheeze or symptoms of upper respiratory tract infections [5].

Over 90% of patients with acute exacerbation of chronic obstructive pulmonary disease are treated with antibiotics although the effectiveness of many is uncertain because of emergence of resistant strains and changing spectrum of organisms in the past 1-2 decades [6]. Hence this study aims to know the spectrum of organisms causing acute exacerbation of chronic obstructive pulmonary disease.

**MATERIALS AND METHODS**

50 patients who were admitted with acute exacerbation of Chronic Obstructive Pulmonary Disease at Sri Dharmasthala Manjunatheshwara hospital were studied over a period of 5 months between January and May 2017.

A detailed history regarding presenting complaints like cough with expectoration, fever, breathlessness, swelling of lower limbs, palpitations was enquired in all cases. History of Hypertension, Diabetes, Smoking, Alcohol consumption was noted. A thorough clinical examination was done.

Investigations like Complete Hierogram, Random blood glucose, Renal function test, Liver function test, Urine routine, Chest X-Ray, 2D-ECHO, ECG were done. A thorough Sputum Examination for different Organisms was done.

**Inclusion criteria**

Patients with acute exacerbation of chronic obstructive pulmonary disease characterized by dyspnea, increased sputum volume and sputum purulence.

**Exclusion criteria**

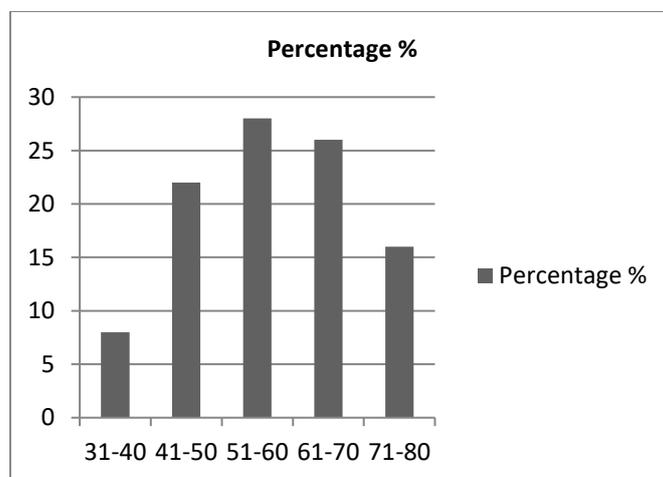
Patients previously diagnosed to have asthma, cystic fibrosis and bronchiectasis. Patients on antibiotics, 5 days prior to collection of sputum sample.

**OBSERVATIONS AND RESULTS**

In this present study, sputum culture and sensitivity was done in 50 patients with acute exacerbation of chronic obstructive pulmonary disease. These patients were treated with appropriate antibiotics for 7 days and the response was noted with change in total count. The following observations were made.

**Table-1: Age distribution studied among patients**

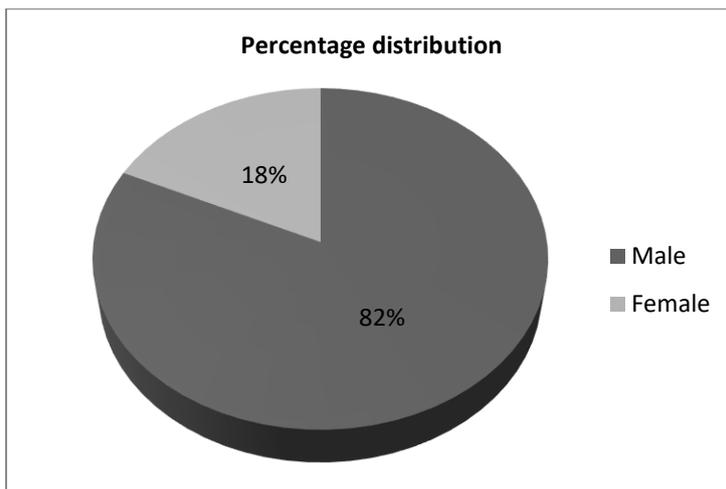
Age in years	No of patients	Percentage %
31-40	4	8
41-50	11	22
51-60	14	28
61-70	13	26
71-80	8	16
Total	50	100



**Fig-1: Percentage Age distribution among study group**

**Table-2: Gender distribution of patients studied**

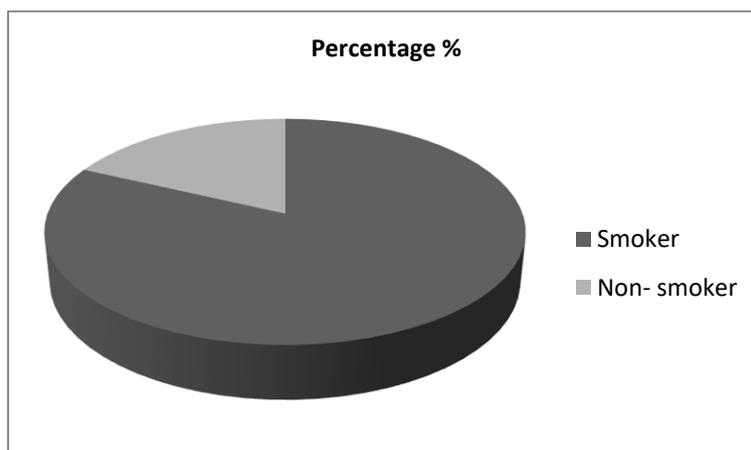
Gender	No of patients	Percentage %
Male	41	82
Female	9	18
Total	50	100



**Fig-2: Percentage distribution among male and female**

**Table-3: Distribution of risk factors**

Risk factor	No of Patients	Percentage %
Smoker	41	82
Non-Smoker	9	18
Total	50	100



**Fig-3: Percentage of Smokers and Non-Smokers**

**Table-4: Pattern of Pulmonary function test**

Pattern of PFT	No of patients	Percentage %
Severe obstruction	30	60
Moderate obstruction	8	16
Mixed Pattern	12	24
Total	50	100

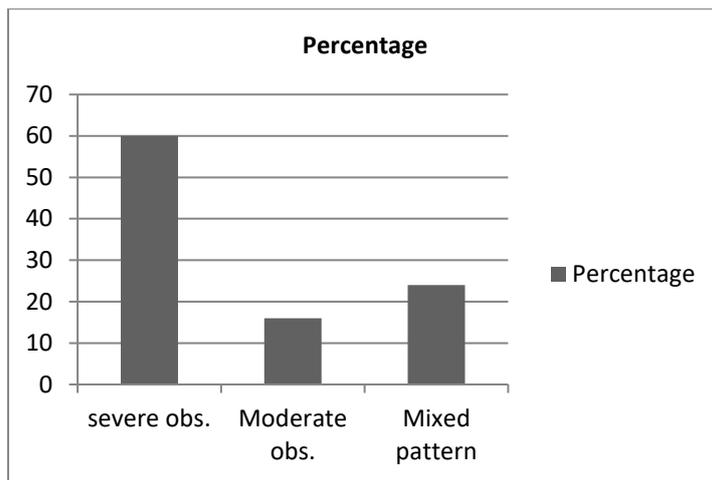


Fig-4: Percentage distribution of different patterns of PFT

Table-5: X- Ray Pattern of patients studied

Pattern	No of Patients	Percentage%
Chronic Bronchitis	12	24
Emphysematous	38	76
Total	50	100

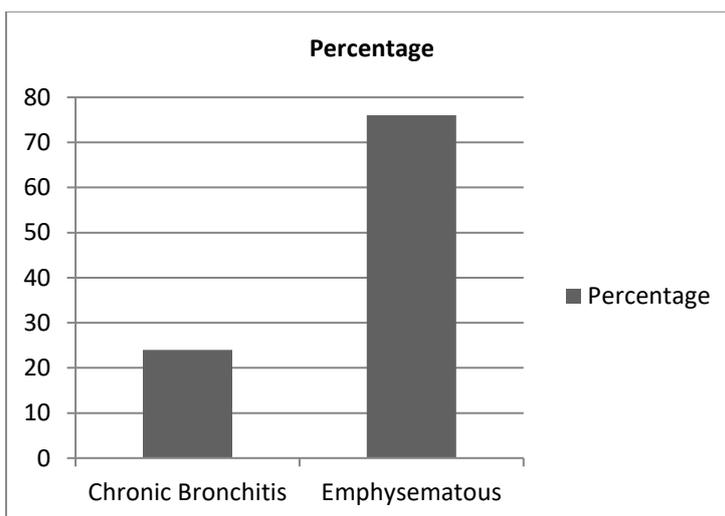


Fig-5: Percentage distribution of different patterns of Chest X-Ray

Table-6: Spectrum of organisms cultured from the sputum of patients

Organism	No of patients	Percentage %
Normal commensals	33	66
Klebsiella	11	22
E Coli	6	12
Total	50	100

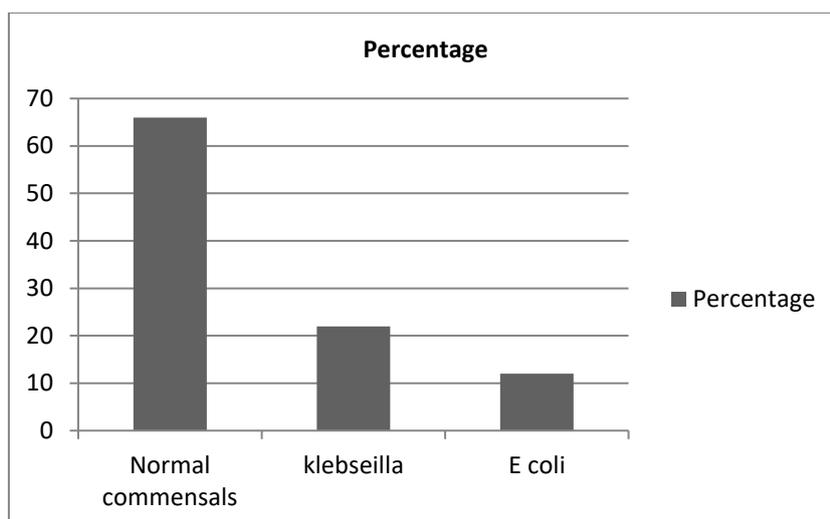


Fig-6: Percentage distribution among spectrum of organisms

Table-7: 2D Echo pattern in patients studied

2D Echo	No of patients	Percentage %
Dilated RA and RV	22	44
Normal	28	56
Total	50	100

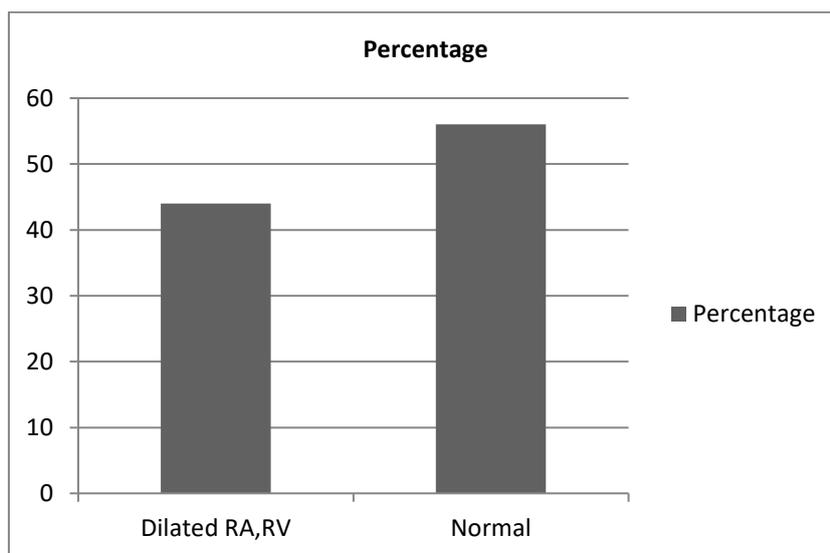


Fig-7: Percentage distribution of different 2D-ECHO findings

**DISCUSSION**

In our study we observed that, the age distribution between 51-60yr was 28%, as shown in table 1. Gender distribution among study population showed that incidence of COPD was more among males that are 82% and females 18%, depicted in table 2. Most of the patients were smokers, particularly males ie 82%, history of use of fuel for cooking was elicited in female patients. Family history of COPD was found among 40% of patients, genetic study for cause of COPD was not done.

In a study done by Furgan *et al.* at Abbasi Shaheed hospital, Karachi in July 2009- Jan 2010 showed the mean age distribution of patients with COPD was 62 +/- 10.2 and 90% were males, which is similar to our study. The culture and sensitivity pattern observed in our patients showed increasing trend for Gram negative organisms like Klebsiella and E Coli by 22% and 12% respectively. Normal commensals were found in about 66% of the populations. Normal commensals were found in most of the patients probably due to viral infection as a cause of exacerbation, which can be grown on usual culture

media. This changing trend from Gram positive to Gram neg is observed due to antibiotics abuse and resistance. This changing pattern is also shown in a retrospective study done at Taipei country hospital; Taiwan between Jan 2000-June 2004 by Lin SH *et al.* [7] showed that predominant organisms in cases with acute exacerbation of COPD were Klebsiella 19%, Pseudomonas aeruginosa 16%, H. influenzae 7.5% followed by Acinetobacter, Enterobacter, and Staphylococcus aureus. Streptococcus pneumoniae in 2.4% of the cases.

In A prospective case control study done by Bari MR *et al.* [8] on 90 cases of acute exacerbation of chronic obstructive pulmonary disease at National institution of diseases of the chest and hospital at Dhaka during Jan 2003- Dec 2003 showed Pseudomonas aeruginosa, Klebsiella pneumonia and lesser percentage of patients with Streptococcus pneumoniae, Hemophilic influenza. A review article by Chawla K *et al.* [9] showed that Gram negative organisms are found most commonly in acute exacerbation of COPD than Gram positive.

More commonly Klebsiella around 30%. In the Pulmonary function test done among our patients showed severe obstructive pattern in 60%, moderate obstructive among 16% and mixed pattern was observed in 24% of patients. Patients with Gram neg organisms in their sputum were found to have severe obstructive pattern. 9/11 patients with Klebsiella had severe obstructive pattern and 4/6 patients with E-Coli had severe obstruction. Total count in patients with Klebsiella and E coli infection were found to have higher total leucocyte count ( 15000-16000 cells/mm<sup>3</sup>) compared to patients with normal commensals ( 10000-11000 cells/mm<sup>3</sup>). ICU admission was noticed in 24% of patients with AECOPD.

## CONCLUSION

Our study showed increasing prevalence of Gram negative organisms like Klebsiella, E-coli and non-fermenters as a cause of acute exacerbation of COPD. Increased mortality in patients with sputum positivity for Gram negative organisms was noticed in our study. Increased ICU admission in patients with sputum positivity for Gram negative organisms was seen in this study.

## SUMMARY

Chronic obstructive pulmonary disease is preventable and treatable disease. In India, COPD is the second most common lung disorder next to pulmonary tuberculosis. Exacerbations of COPD cause morbidity, repeated hospitalization and mortality and strongly influence health-related quality of life. Infection of respiratory tract being most common cause. Change in spectrum of organisms is noticed in our study, Gram negative organisms are increasing in trend as a cause of acute exacerbation in COPD. Increased mortality and ICU admission are also noticed in patients with sputum positivity with Gram Negative organisms. Hence knowledge of changing trend in organisms become most important in the management of patients in In-Patient and ICU set up.

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