

Original Research Article

Clinical profile and bacteriological etiology in cases of acute exacerbation of COPD in a tertiary care: a tertiary care study

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ABSTRACT

Background: Acute exacerbation a prominent feature of COPD, is a major entity altering the course of the disease. These exacerbations are by complex interactions between host, bacteria, viruses and environment. Many studies done earlier indicate bacteria being the major cause of these exacerbations. This study is hence done to determine the bacteriological profile, haematological profile severity and grade clinical signs and symptoms based of 'Gold' criteria.

Methods: A cross sectional descriptive study, done on a total of 80 cases for a period of 18 months on patients admitted to Sathya Sai medical college with acute exacerbations of chronic obstructive pulmonary disease. Cases of acute exacerbation of COPD satisfying the eligibility criteria were included in the study. Clinical and microbiological parameters were noted with special preference to sputum culture and spirometry.

Results: Bacteria was not present in 46 (57.5%) of the study population. Klebsiella pneumoniae was present in 12 cases (15.0%), pseudomonas aeruginosa in 6 (7.5%), staphylococcus aureus in 6 (7.5%), streptococcus pneumoniae in 5 (6.2%) and actinobacter in 5 (6.2%). 34 cases were sensitive to antibiotics (52.5%). Majority being sensitive to ceftriaxone, piperacillin and levofloxacin. 43 cases belonged to 'Gold' criteria on spirometry. Hyper inflated lung, tubular heart was present in 39 (48.8%) cases. With normal chest X-ray findings in the rest.

Conclusions: Bacteria causing exacerbations is different in India as compared to other studies from different countries. Klebsiella pneumonia being most common organism followed by Pseudomonas aeruginosa, Staphylococcus aureus, Streptococcus pneumoniae and actinobacter. AECOPD patients with bacteria showed sensitivity to ceftriaxone, piperacillin and levofloxacin. Hence, these etiology with sensitivity pattern should be kept in mind for starting a patient on empirical antibiotic therapy.

Keywords: AECOPD, COPD, Acute exacerbation of chronic obstructive pulmonary disease, Chronic obstructive pulmonary disease, Bacteriological profile, Antibiotic sensitivity

INTRODUCTION

Chronic obstructive pulmonary disease (COPD), is an obstructive disease of the airway which includes emphysema and chronic bronchitis. There is a gradually progressive airflow limitation causing reduction in lung functions.¹ Acute exacerbations interrupts the normal course of the disease. It's a preventable non-reversible airway disease.²

COPD today is the third major cause of death all around the world. Exacerbations is associated with increased mortality and morbidity, reducing the quality of life, increased health care expenditures.³

Exacerbations of COPD during the course of the disease is defined as sustained worsening of the patient's condition from stable state, which is acute causing change of

prescription and requiring hospitalisation. These are due to complex involvement of host, bacteria and environment.⁴

Tobacco smoking is a major risk factor for COPD.⁵ Several other studies suggest bacterial and viral infections as the major cause of exacerbation. Major studies suggest haemophilus influenza, streptococcus pneumoniae, moraxella and pseudomonas as the major cause involved in exacerbations.⁶

Several other viruses and bacteria are also involved in causing exacerbations. Emergent pathogens causing the disease are beta lactamase and metallo beta lactamase.⁷

The studies done in India regarding the cause of exacerbation is less. Hence, this study is undertaken to put forth the profile, antibiogram, the haematological profile and severity of clinical findings based bacteriological on ‘Gold’ criteria.

METHODS

This is a cross sectional descriptive study done among a total of 80 cases both men and women. Patients included were all above 40 years with acute exacerbation of COPD admitted in Shri Sathya Sai medical college, Ammapettai, Tamil Nadu. Study was conducted for a period of 18 months from March 2019 to September 2020. Cases of acute exacerbation were those with increase in sputum quantity, needing hospital admission or a new prescription.

Patients included in the study were known cases of COPD over the age of 40 years who may or may not be a smoker, having features of sudden increase of cough and shortness of breath, change in the volume of sputum or its purulence, patient becoming febrile with neutrophilia, spirometry findings shows increased reduction of FEV1 and FEV1/FVC ratio. Increase in the stage of ‘Gold’ criteria.

Patients who had no history of COPD in the past, patients who is a case of COPD, now with exacerbation and already on antibiotics, patients with bronchiectasis findings on chest X-ray PA view, patients with tuberculosis of lung on ATT, patients with restrictive pattern of lung disease and patient with lung cancers were excluded from the study. The minimum calculated sample size from the previous study with a prevalence of 47.22% is 80.

Procedure

Ethical committee approval was taken from the institution before the starting the study. Sampling was eventually followed. After establishing a good rapport with the study subjects, the purpose, procedure objectives, benefits, risks and confidentiality of the procedure was explained to the study subjects in their local dialect. An informed consent from the study subject was taken before the interview. Data was collected from eligible patients such as the age, sex, body mass index were noted. Smokers were identified. Past medical history was obtained. Sputum

examination, chest X-ray and spirometry was done. Sputum samples were sent for sputum culture, antibiotic sensitivity testing. Spirometry assessed FEV1 and FEV1/FVC ratio. Total leucocyte count and differential count was checked using 5 ml of venous blood from the patient taken under septic precautions.

Statistical analysis

Data collected was put up in an excel sheet, SPSS software 16th version was used for the analysis. P-value below 0.05 was considered significant.

RESULTS

In a total of 80 patients, all had cough, shortness of breath and chest pain. 53 cases had fever, 13 cases had chest pain (Table 1), 38 patients were smokers with 10 minimum pack years and maximum of 50 pack years. Among the comorbidities, 13 patients had diabetes mellitus, 16 had coronary artery disease and 1 patient had epilepsy.

Table 1: General examination findings of the study population.

Clinical finding	Frequency	Percentage
Cough	80	100
Expectoration	80	100
Breathlessness	80	100
Fever	53	66.2
Chest pain	13	16.2

In bacteriological profile of study population (Table 2), No bacteria was present in 46 cases. Among the cases with positive bacteriology klebsiella pneumoniae was present in 6 cases, staphylococcus aureus was present in 6 cases, streptococcus pneumoniae was present in 5 and actinobacter was present in 5.

Table 2: Bacteriological profile of the study population.

Infection	Frequency	Percent
Absent	46	57.5
Klebsiella pneumoniae	12	15.0
Pseudomonas aeruginosa	6	7.5
Staphylococcus aureus	6	7.5
Streptococcus pneumoniae	5	6.2
Actinobacter	5	6.2
Total	80	100.0

In sensitivity pattern of the study population (Table 3), Antibiotic sensitivity is present in 34 (52.5%) of the study population. Antibiotic sensitivity of the study population is represented in the following table and bar chart, (as the same patient shows sensitivity to multiple drugs, total percentages will exceed 100%).

Table 3: Antibiotic Sensitivity of the study population.

Antibiotic sensitivity	Frequency	Percent
Ceftriaxone	29	36.2
Cefoperazone sulbactam	23	28.8
Piperacillin tazobactam	29	36.2
Gentamycin	25	31.2
Levofloxacin	30	37.5
Amoxicillin clavulanic acid	21	26.2
Amikacin	12	15
Imipenam	24	30
Vancomycin	5	6.2
Linezolid	5	6.2
Clindamycin	3	3.8
Cotrimoxazole	1	1.2

In spirometry findings of the study population (Table 4), Majority of the study population 43 (53.8%) were belonging to ‘Gold’ criteria 2. This is represented in the following table. Chest X-ray findings of study populations showed 49% hyperinflated lungs and 51% normal lungs.

Table 4: Spirometry findings of the study population.

Gold criteria	Frequency	Percent
1	11	13.8
2	43	53.8
3	20	25.0
4	6	7.5
Total	80	100.0

Table 5: Cross tabulation between presence of microorganism and spirometry and ‘Gold’ criteria.

		Micro-organism		Total	P-value	
		Absent	Present			
Spirometry	1	Count	8	3	11	0.331 (not significant) (Chi square test used)
		% within spiro	72.7	27.3	100.0	
	2	Count	23	20	43	
		% within spiro	53.5	46.5	100.0	
	3	count	10	10	20	
		% within spiro	50.0	50.0	100.0	
	4	Count	5	1	6	
		% within spiro	83.3	16.7	100.0	
Total	Count	46	34	80		
	% within spiro	57.5%	42.5	100.0		

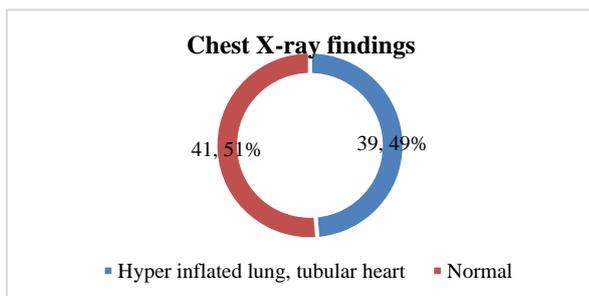


Figure 1: Chest X-ray finding.

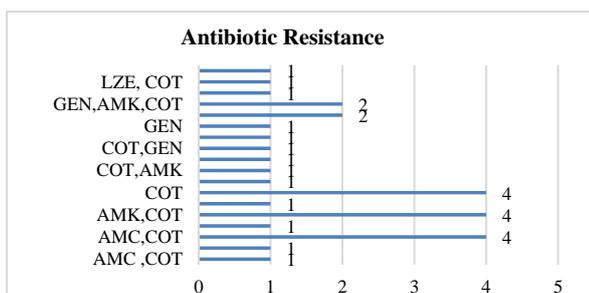


Figure 2: Antibiotic resistant pattern.

DISCUSSION

COPD exacerbations are more common during winter when the respiratory viral infections are more prevalent in the environment. The objective of this study was to analyze the bacteriological profile by sputum culture, to do spirometry and to assess severity along with antibiotic sensitivity pattern in cases of acute exacerbation of COPD.

Anand Ambali et al, did a study on total of 66 cases on cases of acute exacerbation of COPD, in Karnataka. This study indicated that streptococcus pneumoniae was the common organism with maximum sensitivity to cefoperazone.⁸ This study mainly included older patients and showed a mortality rate of 1.5%. This was supported by many other studies, which said that older patents had a higher mortality rate. In this study participants, all had cough, sputum and breathlessness. Fever was present in 53 cases and chest pain in 13. This symptomatology was similar to studies done by Arora N et al.⁹

In the study done above, 38 patients were smokers. The mean pack years being 24.12 and median was 23.5. The minimum pack years being 10 and maximum being 50.

The severity of COPD was influenced by colonization of bacteria and viruses and smoking.¹⁰

Gauri Kulkarni et al, did a study on 45 patients in Nashik on cases of acute exacerbation of COPD quoted that AECOPD is much more in males over 50 years of age with smoking habits.¹¹

Many previously published studies done outside India suggests bacteria and virus as the major cause of AECOPD. A very minority of studies suggest environment factors as the cause. Study results are similar to the ones done in India but very few in number.^{12,13}

Chawla K et al, hospita-based study done in Karnataka on AECOPD patients, quoted bacteriology as the cause in 50 percent of cases. Pseudomonas aeruginosa as the most common cause followed by klebsiella and haemophilus.¹⁴ Anand Patel et al, quoted streptococcus pneumoniae as the most common cause.¹⁵

Emergence of antibiotic resistance is increasing on day to day basis.¹⁶ Alaa Hassan et al did a study on 156 patients and quoted that the commonest bacterial resistance was towards penicillins and cephalosporins followed by fluoroquinolones. Also, more severe disease is associated with increased resistance.¹⁵ Anand Patel et al, indicated piperacilline and tazobactam as very effective antibiotic for the most common organisms.¹⁵ Gauri Kulkarni et al, quoted ciprofloxacin with amikacin as the best choice for empirical therapy. This study had 39 cases with hyperinflated lung and tubular heart suggesting the clinical severity of cases in acute exacerbation of COPD.¹⁷ Also, mortality rates were correlated with decreased lung parameters. Study done by Parvaiz Koul et al, suggested the various factors associated with increased mortality.¹⁸

This study is a hospital-based study carried out in tertiary care setting. Hence, it cannot be applied to the rural areas with primary health care settings. Follow up of sputum cultures was not performed, hence the resistance pattern for further use could not be interpreted. Bronchoscopy was not the method used to collect sample which is a better method to be done in order to study the microbiology.

Limitation of this study was, if a greater number of cases had been studied and more time had been there, the study would have had a broader spectrum of pathogens involved. This study was a hospital-based study carried out in tertiary care setting. Hence, it cannot be applied to the rural areas with primary health care settings.

CONCLUSION

All the patients in the study had cough, shortness of breath and expectoration indicated the clinical severity of cases of acute exacerbation of COPD. Fever was present in 53 cases and chest pain in 13 cases. 38 cases in the study were smokers which suggests smoking as an important factor in the episodes of exacerbations.

Bacteria was not present in 46 cases. Among the cases with positive bacteriology klebsiella pneumoniae was present in 12, pseudomonas aeruginosa was present in 6, staphylococcus aureus was present in 5 and actinobacter in 5 cases. Majority of the organisms were sensitive to ceftriaxone, piperacillin and levofloxacin. Hence, these drugs can be chosen as empirical antibiotics in the early management of AECOPD cases.

By spirometry majority of the cases belonged to GOLD criteria 2, which indicates the severity in the reduction of a lung functions and hence the quality of life.

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