



Sputum Bacteriology in Patients having Acute Exacerbation of Chronic Obstructive Pulmonary Disease in a Tertiary Care Hospital

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ABSTRACT

Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication. Exacerbations of COPD are caused by various factors such as viruses, bacteria, and possibly common pollutants. The study is conducted to know the bacteria predominantly causing the acute exacerbation of COPD in our region. **Methods:** A prospective observational study was conducted among 180 patients, admitted to the pulmonology department of a tertiary care hospital. Bacterial infections of AECOPD were analyzed. The sputum samples were subjected to culture study. **Results:** About 42.77% of cultures were positive for pathogenic bacteria. Among the pathogenic bacterial growth, the most common pathogenic bacteria isolated in sputum culture was *Klebsiella pneumoniae*, followed by *Pseudomonas aeruginosa*, *Acinetobacter*, *Haemophilus influenzae*, *E. coli*, *Streptococcus pneumoniae*, *Staphylococcus aureus*, *Moraxella catarrhalis*.

Keywords: AECOPD, Sputum, Gram positive organisms, Gram negative organisms

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a disease state characterized by airflow limitation and is irreversible, which includes chronic bronchitis and emphysema. COPD is preventable and treatable disease is characterized by persistent airflow limitation that is usually progressive and associated with an enhanced chronic inflammatory response in the airway and the lung to noxious particles or gases. Acute exacerbation of chronic obstructive pulmonary disease (AECOPD) is an acute event characterized by a worsening of the patient's respiratory symptoms that is beyond normal day-to-day variations and leads to a change in medication [1-3].

Worldwide, the most commonly encountered causes of COPD are tobacco smoking. Outdoor, occupational, and indoor air pollution such as burning of biomass fuels - are other major cause of COPD. AECOPD is associated with various factors such as viruses, bacteria, and pollutants. The most community-acquired infections are due to *Haemophilus influenzae*, *Klebsiella pneumoniae*, *Moraxella catarrhalis*, *Streptococcus pneumoniae*, *H. parainfluenzae*. Infection with *Pseudomonas aeruginosa* may cause exacerbations of COPD. Known viral causes of exacerbation of COPD include influenza, parainfluenzae, rhinoviruses, coronavirus, and adenovirus [4,5].

METHODOLOGY

A prospective observational study was conducted among 180 patients, selected from a total of 250 patients admitted to the pulmonary medicine department. Samples were collected. Sputum culture results were collected and entered into the data entry form. From the total population of patients with acute exacerbation of COPD, the proportion of patients having bacterial infection and the bacteria predominantly causing the acute exacerbation of COPD in our region is isolated. The reports were analyzed, documented and then presented.

RESULTS

Out of 180 patients with acute exacerbation of COPD, 138 (76.7%) were males and 42 (23.3%) were females. The age group of the patients included in the present study ranged from 30-90 years. Out of 180 patients, maximum number (134) belonged to the age group of 60-79 years. In our study, out of 180 patients 96 (53.34%) were current smokers, 55 (30.56%) patients were ex-smokers and 29 (16.1%) were non-smokers.

Proportion of organisms isolated

The sputum samples of 180 patients were subjected to culture study. Out of which 77 (42.77%) were positive for pathogenic bacteria and 103 (57.23%) were normal flora (Table 1).

Table 1 Proportion of organisms isolated

| Variables | Frequency | Percentage |
|--------------|-----------|------------|
| Normal flora | 103 | 57.23% |
| Bacteria | 77 | 42.77% |

Organism Isolated in AECOPD

Among the pathogenic bacterial growth, there are 9 types of bacterial strain, out of which 7 were gram-negative bacteria (77.78%) and 2 were gram-positive bacteria (22.22%) (Figure 1).

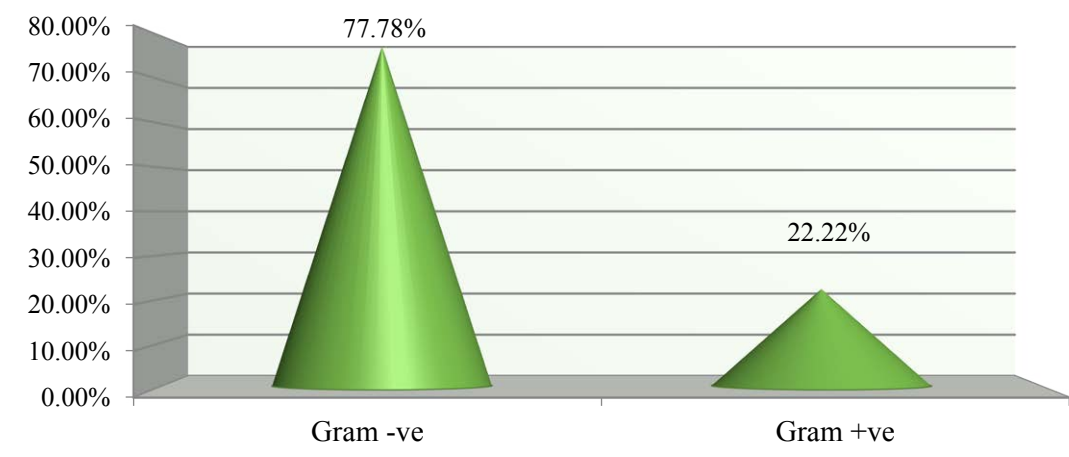


Figure 1 Organism isolated in AECOPD

Specific organism isolated in AECOPD

The most common pathogenic bacteria isolated in sputum culture was *Klebsiella pneumoniae* 21 (27.29%), followed by *Pseudomonas aeruginosa* 19 (24.68%), *Acinetobacter* 9 (11.69%). Other common organisms isolated were *H. influenzae* in 7 cases, *Escherichia coli* & *Streptococcus pneumoniae* in 6 cases, *Staphylococcus aureus* in 5 cases, *Moraxella catarrhalis* in 3 cases and *Burkholderia cepacia* in 1 case.

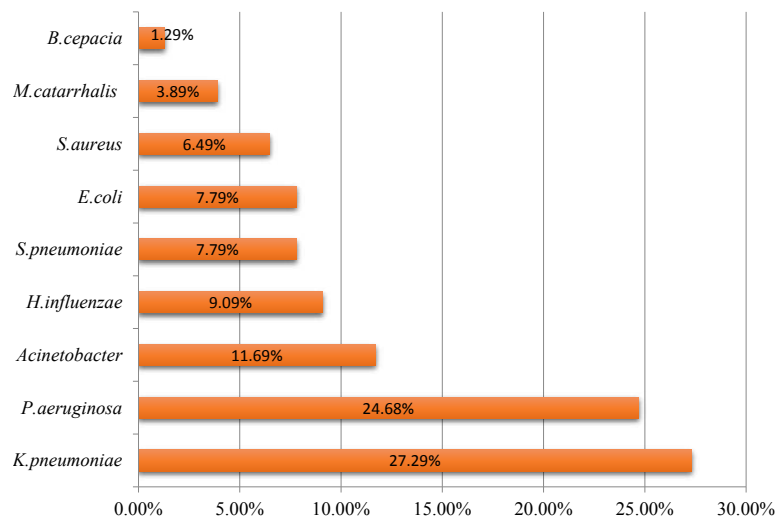


Figure 2 Bacteriological profile of the patients with AECOPD

DISCUSSION

The age group of patients ranged from 30-90 years. However, among them, maximum numbers of AECOPD cases (74.47%) belongs to 60-79 year of age. This is comparable to studies undertaken by Gurumayum, et al. (61-75 years). Out of 180 patients, clinically diagnosed as acute exacerbation of chronic obstructive pulmonary disease, 138 (76.7%) were males and 42 (23.3%) were females. A prospective study was made by Madhavi, et al. who had 79% males and 21% females. In our study, 53.34% of patients were smokers and 16.1% were non-smokers. A study conducted by Devanath, et al. showed AECOPD was more common among smokers 62.5% than non-smokers 37.5% [6-9].

In the present study, a significant bacterial growth was found in 42.77% of patients during exacerbation attack Iyer, et al. isolated 45% bacterial pathogens from sputum in patients with COPD during exacerbations. The remaining 57.23% of the cases could be due to prior antibiotic administration or due to inability to include cultivation methods for viral and mycological pathogens. The prevalence of gram negative isolates was 77.78%, as compared to 22.22% of gram positive. Gram-negative bacilli were also the predominant organisms in the study done by Siripataravanit, et al. [10,11].

In our study, the most common organism isolated was *Klebsiella pneumoniae* (27.29%) followed by *Pseudomonas aeruginosa* (24.68), *Acinetobacter* (11.69%), *Haemophilus influenzae* (9.09%), *Streptococcus pneumoniae* (7.79%), *E. coli* (7.79%), *Staphylococcus aureus* (6.49%), *Moraxella catarrhalis* (3.89%), *Burkholderia cepacia* (1.29%). This finding is contrary to other studies reported by Seshagiri Rao, et al. in 2017 who had found *Streptococcus pneumoniae* (28%) while Anand Patel, et al. had found *Klebsiella pneumoniae* (59%) as commonest isolate (Figure 2) [3,12].

CONCLUSION

In this prospective observational study, we analyzed the bacteriological profile of the patients with AECOPD. Bacterial infections play a major role in AECOPD and were seen more in the age group of 60-79 years. Sputum culture is a good and simple tool to study the aetiology and complications due to bacteria in an acute exacerbation of chronic obstructive pulmonary disease (AECOPD).

In the present study, a significant bacterial growth was found in 42.77% of patients during exacerbation attack. The prevalence of Gram negative isolates was 77.78%, as compared to 22.22% of gram positive. In our study, the most common organism isolated was *Klebsiella pneumoniae* (27.29%) followed by *Pseudomonas aeruginosa* (24.68), *Acinetobacter* (11.69%).

DECLARATIONS

Acknowledgement

We would like to thank gratefully and sincerely Prof. (Dr). MK Unnikrishnan and Dr. Abdul Samad for their keen interest, timely help and valuable suggestions from very beginning till the completion of the study.

Ethics approval and consent to participate

All participants provided written informed consent and the study was given ethical approval from the Institutional Ethics Committee (NCP/IEC/2016/No: 057).

Competing interests

The authors declare that they have no competing interests, financial or otherwise.

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