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Research Article

Bacteriological profile and antibiotic sensitivity pattern in sputum culture of chronic obstructive pulmonary disease patients

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a common disease characterized by persistent airflow obstruction with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. The aim of the present study was to obtain comprehensive insight into the bacteriological profile and antibiotic sensitivity pattern in sputum culture of COPD patients.
Methods: A retrospective observational study was carried out at Bangalore medical college, Bangalore which comprised of 100 patients diagnosed with chronic obstructive pulmonary disease from June 2015 to July 2015. Sputum culture and sensitivity reports were retrospectively analysed for the bacteriological profile and their antimicrobial sensitivity pattern.
Results: Hundred patients diagnosed with COPD included with the age group comprising from 40 to >80 years of age, most common pathogenic bacteria isolated was *Streptococcus pneumonia* (42%), followed by *Pseudomonas aerogionsa* (23%), *Klebsiella* (15%), *E coli* (12%), *GNNF* (7%) and *citorbacter* (1%). Ceftriaxone was the most effective antibiotic against *Streptococcus pneumonia*.
Conclusions: *Streptococcus pneumoniae* was the most common pathogen in COPD patients, and ceftriaxone was most effective antibiotic against the most of the organism. Ceftriaxone should be the first line empirical antibiotic.

Keywords: COPD, Bacteriological, Sputum culture, Antibiotic

INTRODUCTION

Chronic Obstructive Pulmonary Disease (COPD) is a progressive chronic disease which is characterized by persistent airflow obstruction with an enhanced chronic inflammatory response in the airways and the lung to noxious particles or gases. COPD is a major cause of morbidity and one of the principal causes of the death worldwide. It is the fourth leading cause of death in the world and COPD is expected to be the third leading cause of death worldwide by 2020.[1] Acute exacerbation of COPD (AECOPD) is defined as a sustained worsening of the patient's condition, from the stable state and beyond normal day-to-day variations, that is acute in onset and necessitates a change in regular medication in a patient with underlying COPD.[2]

The major reason of exacerbations of COPD is the use of antibiotic and admission; it has considerable impact on health care system at both primary and tertiary care levels. In addition, exacerbations lead to indirect costs because of days lost from work.[3] Bacterial infections are the most common cause of AECOPD, It is estimated that bacterial infections are responsible for more than 40% of all exacerbations in India.[4] It has been observed that use of antibiotics used to treat AECOPD has an impact on the

failure rate.[5] More than 90% of patients with AECOPD are treated with antibiotics, due to emergence of resistant strains of most common respiratory pathogens, effectiveness of many is uncertain in past 15 years.[6] Exacerbations may also contribute to irreversible progression of COPD.[7] Now a day investigators needs culture studies for proper selection of antibiotic but it is time consuming process and the facility is not available in most of the institutions. The choice of the antibiotic should be based on the local bacterial resistance pattern.[8] Hence, there is an urgent need of better approach to management of this morbid disease.

The role of bacterial infection in exacerbations of chronic bronchitis and the use of sputum cultures to reach an etiological diagnosis to guide clinical management are subjects of current debates. The objective of this study is to analyse the bacteriological profile of the patients with COPD and also to study their antimicrobial sensitivity pattern, which will help us to design a proper antibiotic regimen to treat the COPD patients, which will have a beneficial effect in morbidity and mortality of the disease.

METHODS

A retrospective observational study was carried out at Bangalore medical college, Bangalore which comprised of 100 patients diagnosed with chronic obstructive pulmonary disease from June 2015 to July 2015. Institutional ethical committee approved our study. patients were recruited under pulmonology department based on inclusion: Patients diagnosed with COPD on the basis of history of exposure to risk factors, clinical history and examination supported by spirometry and chest x ray and exclusion criteria:Patients having bronchiectasis, tuberculosis, pneumonia, malignancy and other evident disease on chest x-ray; patients having sputum positive for acid fast bacilli (AFB). Sputum culture and sensitivity reports were retrospectively analysed for the bacteriological profile and their antimicrobial sensitivity pattern, each patient's data were categorised under age, sex, bacterial organism and sensitive antibiotic for that particular bacteria. All the collected data was tabulated and stastically analysed by using SPSS software.

RESULTS

Hundred patients were included in the study; the mean age of patients was 63.18 years (40-81) which comprises of 84% of males and 16 % of female patients. Maximum numbers of patients were in the age group of 61- 70 years. (Table 1) In the present study we observed that, the most commonest pathogenic bacteria isolated in sputum culture was *Streptococcus pneumoniae* 42 (42%), followed by *Pseudomonas aeuroginosa* 23 (23%), *Klebsiella* 15 (15%), *E coli* 12 (12%), gram-negative non fermenting bacteria (GNNF) 7 (7%) and *Citrobacter* 1 (1%). Antibiotic sensitivity pattern of all organisms is shown in Table 2. Sensitivity of all antibiotic was tested in all patients, *Streptococcus pneumoniae* which was the commonest isolate in the culture was sensitive to ceftriaxone - a third generation cephalosporin, and only few strains of *Streptococcus pneumoniae* were sensitive to piperacillin–tazobactum, cefotaxime and azithromycin.

Table 1: Age and sex distribution of patients.

Age (years)	Male	Female	Total
≤40	4	0	4
41-50	13	2	15
51-60	20	8	28
61-70	28	1	29
71-80	12	5	17
≥81	7	0	7
Total	84	16	100

Table 2: Distribution of organisms and sensitivity pattern of antibiotic

Bacterial organism	Percentage of patients isolated	Sensitive antibiotic
Streptococcus pneumoniae	42 %	Ceftriaxone
Pseudomonas aeroginosa	23 %	Piperacillin - tazobactum
Klebsiella	15 %	Ceftriaxone
E coli	12 %	Ceftriaxone
GNNF	7 %	Amikacin
Citrobacter	1 %	Ciprofloxacin

Pseudomonas aeuroginosa, prevalent gram-negative isolate was sensitive to piperacilin-tazobactum, amikacin and levofloxacin, while *Klebsiella* and *E coli* both were sensitive to ceftriaxone. Beside this gram-negative non-fermenting bacterium was sensitive to amikacin and another strain *Citrobacter* which was least isolated, sensitive to quinolone group ciprofloxacin

DISCUSSION

A retrospective observational study was conducted to investigate the sensitivity pattern of antibiotic in patients with COPD. Bacterial infections are generally considered to be the most common cause of COPD. In our study bacteria was isolated from majority of patients. Accordingly, antibiotics should be administered in inpatients and outpatients with AECOPD exacerbations and change in sputum characteristics suggestive of bacterial infection. COPD exacerbations may be triggered by acquisition of new bacterial species or by an increase in the absolute number of same bacteria or their different strain that colonize the airways Culture positivity depends on nature of sputum, transportation time and the number of organism present in the sample.

Hundred patients were included in the study; the mean age of patients was 63.18 years (40-81) which comprises of 84% of males and 16 % of female patients. Maximum numbers of patients were in the age group of 61- 70 years. (Table 1) Which can be explained by the fact that chronic bronchitis has highest prevalence in fifth and sixth decade.

Predominance of male over female patients as shown in the study can be explained by the fact that in our country males are exposed more to outside environment because of their more mobility as compare to females. Moreover smoking habits are more pronounced in males that constitute one of the predisposing factors for the development of COPD. Smoking and air pollution are responsible for decrease in mucociliary clearance and innate immunity. It leads to increased bacterial colonization that can give rise to increased airway inflammation and thus exacerbations.

The most common pathogen isolated from sputum culture was *Streptococcus pneumoniae* (42%) in COPD patients. But other Indian study has reported different strain *Pseudomonas aeruginosa*.[4]

While Madhavi et al, had found *Klebsiella pneumonia* was the most common organism.[9] We observed that third generation cephalosporin ceftriaxone was the most effective antibiotic against the *Streptococcus pneumoniae*, but these results is contrary to Patel AK et al, which found that piperacillin-tazobactum was most effective against *Streptococcus pneumonia*.[10]

Where as in our study we found that piperacillin – tazobactum was effective against gram-negative organism *Pseudomonas aeruginosa*. Ceftriaxone was also most effective against gram-negative organism like *klebsiella* and *E coli*. It has been observed that quinolone like ciprofloxacin was mostly resistant to all bacteria, except *Citrobacter* which was only the sensitive against ciprofloxacin, this may be because of very frequent use of quinolones in this area.

CONCLUSION

In summary, in this retrospective study we analysed the bacteriological profile of the patients with COPD and also their antimicrobial sensitivity pattern. *Streptococcus pneumonia* is the most common pathogen in patients with COPD, and ceftriaxone is most effective antibiotic against most of the organism.

Here we conclude that ceftriaxone should be the first line as empirical antibiotic to be used in patients with COPD, and at the same time proper antibiotic policy to be developed and implemented in a hospital to prevent the emergence of resistance.

Limitations of present study

Since the present study was retrospective study, hence cannot be commented on sputum collection and culture methods.

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