



AEROBIC BACTERIOLOGICAL STUDY OF ACUTE EXACERBATIONS OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE IN A TERTIARY CARE HOSPITAL IN HADOTI REGION

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ABSTRACT

Background: The natural history of chronic obstructive pulmonary disease is characterized by frequent exacerbations. The purpose of this study was to determine the bacteriology of acute exacerbations of chronic obstructive pulmonary disease in hospitalized patients in our institution and their antibiotic susceptibility pattern to formulate cost effective antibiotic strategy and reducing the emergence of drug resistance.

Materials and Methods: 50 clinically diagnosed cases of AECOPD admitted in medicine and chest wards were selected for the study. Direct gram stain was done for all sputum samples. The suitable sputum samples were cultured. Identification of organism and antimicrobial susceptibility testing was done by standard microbiological technique

Results: Our study showed growth of pathogenic organisms in 41.12% cases. Males (61.90%) are more affected than females (23.71%). Gram negative bacilli were more isolated than gram positive cocci. Our study showed 21 positive sputum cultures and 76.20% were males and 23.80% were females. The prevalence of Gram negative bacteria was 71.42% and Gram positive bacteria were 28.58%. *Klebsiella pneumoniae* was the commonest bacteria isolated 6 (28.57%), followed by *E.coli* 4 (19.0%), *Staphylococcus aureus*, *Streptococcus* species & *Pseudomonas aeruginosa*, each 3 (14.28%) & *Acinetobacter* species 2 (9.53%). The antibiotic susceptibility reveals that vancomycin, linezolid, azithromycin were most effective drugs for gram positive cocci, meropenem, ceftriaxone, imipinem for gram negative bacilli and amikacin & piperacillin-tazobactam for both gram positive cocci & gram negative bacilli.

Conclusion: In developing country like India AECOPD is common in adults more than 50 years of age due to smoking habits and high indoor pollution. This leads to a major impact on the quality of life of patients with the condition. They are a major cause of hospital admission and health care utilization

KEYWORDS : AECOPD, Co-morbidities, Sputum, Antibigram

INTRODUCTION

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 [1]. The prevalence of AECOPD varying from 1% in urban non-smoker to 21% in rural smokers [2] and mortality rate of 24% if the patient required ICU admission. This mortality rate increased to 30% if the patient was above 65 years [3]. The clinical guidelines have included Winnipeg criteria, which are based on increased breathlessness, sputum purulence and sputum volume, to diagnose the patients and grade the severity of AECOPD

Three classes of pathogens have been implicated as causing acute exacerbation of COPD by infecting the lower respiratory tract: respiratory viruses (Influenza, Para influenza, Rhinovirus, Corona virus, Adenovirus & RSV), atypical bacteria (*Mycoplasma pneumoniae* & *Chlamydia pneumoniae*) and aerobic gram positive & gram negative bacteria. The variable bacteriological profile in poor lung function gives evidence that they are involved in the progression of the disease. Early diagnosis and knowledge of local bacteriological profile & antibiogram help us to reduce the number of failure cases recorded with empirical treatment during AECOPD. The present work was done to find out the aerobic bacteria and their antibiotic sensitivity pattern in AECOPD as very little reports are available from India.

MATERIALS AND METHODS

50 patients of AECOPD admitted in medicine, tuberculosis and chest wards over a period of 6 months from 1st July 2016 to 31st December 2016 were selected for the study. Variables included for the study were age, sex, smoking, signs and symptoms of the patient. The information regarding these variables was collected by using a pretested questionnaire.

Inclusion criteria: All clinically diagnosed cases of AECOPD formed the subject of the study group.

Exclusion criteria: Patients attending out patient department, sign & symptoms suggestive of coronary thrombosis, localized suppurative infection in the lung, allergic origin pulmonary disease and use of antibiotics before hospitalisation were not included in the study.

Specimen collection: Early morning samples were obtained from cases that were clinically diagnosed as AECOPD. Patients were instructed to collect deep coughed sputum into a sterile wide mouth container with a screw cap after rinsing the mouth twice with plain water.

Specimen transport: The samples were brought to Microbiology laboratory of Govt. Medical College, Kota immediately and processed within 30 minutes of collection.

Culture methods: Direct gram stain was done from sputum sample and reported according to Bartlett's grading system. A score of 1 and above was considered suitable sample [5]. The suitable sputum samples were inoculated onto MacConkey's agar and blood agar plates. All the plates were incubated at 37°C for 24 hours in 7-10% CO₂ concentration. The isolated organisms were identified by standard microbiological techniques [6]. All the isolates were tested for antimicrobial susceptibility (Hi-Media Mumbai) by Kirby-Bauer disk diffusion method on Mueller-Hinton agar [7].

RESULT

BACTERIOLOGICAL PROFILE:

50 sputum samples were subjected to culture study. Out of which twenty one (21) (42%) were positive for pathogenic bacteria and twenty nine (29) (58%) were non pathogenic

AGEDISTRIBUTION:

The age group of the patient in the study, ranged from forty five to eighty five years. Out of twenty one (21) patients, the most common age groups were sixty five to seventy five years (33.33%). The next common age group was forty five to fifty five years (19.04%).

SEX DISTRIBUTION AMONG AECOPD CASES.

Out of twenty one (21) patients, clinically diagnosed as AECOPD, sixteen (16) (76.20%) were males and five (5)(23.80%) were females. The ratio between male and female is 3.2:1.

SMOKING INDEX:

Out of twenty one (21) patients, thirteen (13) were smoking patients and eight (8) were non smokers. The percentages were 38.10% each and 23.80%. In smoking groups, all the patients were male. All females in the study group were non smoker.

BACTERIOLOGICAL PROFILE

Out of twenty one (21) pathogenic bacteria isolated, fifteen (15) (71.42%) were Gram-negative bacteria and six (6) (28.58%) were Gram-positive bacteria . Out of twenty one (21) single pathogenic bacteria, *Klebsiella pneumoniae* was the commonest bacteria isolated, in six (6) cases, followed by *Escherichia coli*, isolated in four (4) cases, *Pseudomonas aeruginosa* in three (3) cases. *Staphylococcus aureus* isolated in three (3) cases and *Acinetobacter spp.*, *Streptococcus pyogenes* were isolated as two (2) and three (3) cases respectively.

ANTIBIOTIC SENSITIVITY PATTERNS OF THE ISOLATES:-

Klebsiella pneumoniae, which was the most common isolate, was sensitive to Amikacin, Meropenem, Imipenem and Cefoperazone-Sulbactam

- *Escherichia coli* which was the next common isolate were sensitive to Amikacin, Ciprofloxacin, Ceftriaxone , Cefotaxime, and Piperillin-Tazobactum.
- *Staphylococcus aureus* , was sensitive to Vancomycin, Piperillin- Tazobactum, Azithromycin, Cefotaxime, Linezolid, Levofloxacin and Co-Trimoxazole
- *Pseudomonas aeruginosa* was mainly sensitive to Gentamicin ,Amikacin, Meropenem, Imipenem and Colistin
- *Strep.pyogenes* was sensitive to Ciprofloxacin and Gentamicin, Penicillin.

Table 1: Showing organism isolated from Sputum Culture

S.No	Name of the organism	number	Percentage
1	<i>Klebsiella pneumoniae</i>	6	28.5
2	<i>Escherichia coli</i>	4	19
3	<i>Pseudomonas aeruginosa</i>	3	14.2
4	<i>Staphylococcus aureus</i>	3	14.2
5	<i>Acinetobacter spp.</i> ,	2	9.5
6	- <i>Strep.pyogenes</i>	3	14.2

Graph 1: Showing organisms and their number of isolates in Sputum Culture

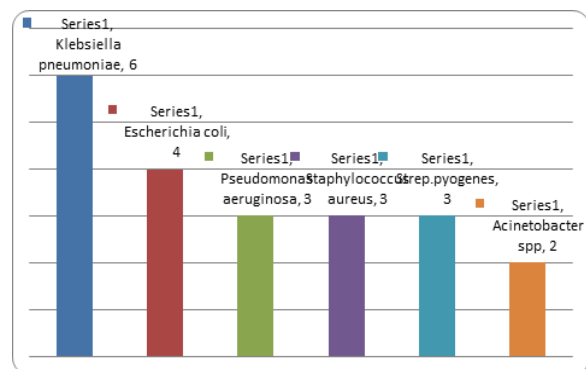


Table 2: Prevalence of Gram positive and Gram negative isolates in 21 positive sputum cultures Organism

Organism	Number	Percentage
Gram Positive	6	28.58
Gram Negative	15	71.42

Table 3: Antibiogram of gram positive organisms

S.No	Antibiotics	Percentage
1	Vancomycin	100
2	Linezolid	100
3	Azithromycin	100
4	Co-trimoxazole	50
5	Amoxy-Clavulinic acid	75
6	Gentamicin	50
7	Amikacin	100
8	Levofloxacin	50
9	Piperillin-Tazobactum	100
10	Cefotaxime	75

Table 4: Antibiogram of gram negative organism

S.No	Antibiotics	Percentage
1	Amikacin	100
2	Imipenem	100
3	Meropenem	100
4	Colistin	100
5	Ceftriaxone	90
6	Cefoperazone-Sulbactam	85
7	Piperillin-Tazobactum	85
8	Cefepime-Tazobactum	70
9	Levofloxacin	80
10	ofloxacin	50
11	Gentamicin	40
12	Cefoxitin	40

DISCUSSION

It was observed that AECOPD prevalent in 41-80 years age group. However among them, 61-70 years age group constituted 73%. Thus, AECOPD was common in advance age group as respiratory tract is more susceptible due to impairment of immunological defence mechanism, associated co-morbid illness, increased duration of seasonal variation & tobacco smoking. Males were affected more than females because they were more involved in smoking & start it in younger age group, therefore more chance of inhalation and increased environmental exposure or temperature variation [8]. In non-smokers, especially among women, exposure to indoor air pollution was an important factor [2]. In our study gram staining findings were in correlation with the culture findings in 90.65% cases; therefore it remained a time honoured method for sputum samples. Aerobic culture positivity was 42.12% which is similar to other study [9]. The prevalence of gram negative isolates was 71.42%, as compared to 28.56% of gram positive isolates corresponding to other studies [10,11]. *Klebsiella pneumoniae* and *E.coli* were common bacteria in our study.

Effective drugs like Vancomycin, Piperillin-Tazobactum, Azithromycin, Cefotaxime, Linezolid are available for treatment of Gram-positive isolates and Amikacin, Meropenem, Imipenem, Colistin, Cefoperazone-Sulbactam are available for treatment of Gram-negative isolates. Least sensitivity was shown with cotrimoxazole & ciprofloxacin.

Health education is a must to highlight the dangers caused by smoking and environmental pollution. There is a need to develop a correct treatment protocol to combat against AECOPD. Following antibiogram, antibiotic policy should be developed. It also helps in screening resistant pathogens and better drug for treatment, thereby helping to decrease the mortality and morbidity associated with co-morbidities. To conclude, in addition to the host genetic factors, smoking behaviour, accessibility to health care and presence of co-morbid conditions contribute to severity due to AECOPD.

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