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Clinical and Bacteriological Profile in Aecopd

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Conflicts of Interest: Nil.

Abstract

Background: The aim of our study is to analyze the hospital data on AECOPD patients with special reference to the pathogens involved and the antibiotic susceptibility.

Methods: 50 patients were included in the study, 80% were males and 20% were females. The sputum specimen was collected using sterile sputum cups and subjected to Gram's stain, culture and biochemical reactions.

Results: In our study growth of the pathogenic organisms was obtained in 40 patients and the prevalence of Gram negative bacteria was 52% and Gram positive bacteria was 14%. Pseudomonas was the commonest pathogen isolated (42%) followed by Klebsiella (23%) among the gram negative bacteria and Streptococcus pneumoniae (42.8%), Staphylococcus aureus(28.5%) were isolated among the gram positive organisms. Majority of gram negative isolates were sensitive to Levofloxacin, Piperacillin-Tazobactum and Amikacin, gram positive isolates were sensitive to Piperacillin-Tazobactum,Azithromycin and cefotaxime.

Conclusion: Predominant organism isolated in our hospital was Pseudomonas and it was sensitive to Levofloxacin and Piperacillin-Tazobactum.

Keywords: COPD, AECOPD, MIC, Antibiogram and Culture.

Introduction

Chronic Obstructive Pulmonary Disease (COPD) is currently the 4th leading cause of death in the world but it is projected to the 3rd leading cause of death by 2020. More than 3 million people died of COPD in 2012 accounting for 6% of all deaths globally (GOLD 2017)[1]. The prevalence of Acute Exacerbation of Chronic Obstructive Pulmonary Disease (AECOPD) varying from 1% in urban non-smoker to 21% in rural smokers and mortality rate of 24% if the patient required ICU admission. This mortality rate increased to 30% if the patient was above 65 years (Sharan, 2015)[2]. It is estimated that bacterial infections are responsible for more than 40% of all exacerbations in India (Chawla, 2008)[3]. COPD is a common, preventable and treatable disease than is characterized by persistent respiratory symptoms and airflow limitation that is due to airway and alveolar abnormalities caused by significant exposure to noxious particles or gases [1].COPD exacerbation defined as an event in the natural course of the disease characterized by a baseline change in the patient's dyspnea, cough, and/or sputum that is beyond the normal day-to-day variations, is acute in onset, and may warrant a change in regular medication in a patient with underlying COPD[1]. Exacerbations of COPD can be precipitated by several factors. In several studies, the presence of bacteria in

AECOPD has been associated with purulence of the sputum and the presence of inflammatory markers [4]. Presenting Features of Acute Exacerbations were increased dyspnea, increased sputum volume, increased sputum purulence, increased wheeze, chest tightness and worsening of previously stable condition

Type of Exacerbations Criteria: According to Anthonisen

- Type1 All the symptoms described above.
- Type2 Any 2 of the above symptoms.
- Type3 Any 1 of the above plus at least 1 of the following: Upper respiratory tract infection lasting ≥5 days, fever, increase in wheezes, increase in cough, and increase in heart rate 20 % [5].

It is estimated that 70 to 80 percent of exacerbations of chronic obstructive pulmonary disease (COPD) are due to respiratory infections.The remaining 20 to 30 percent are due to eosinophilic inflammation, environmental pollution, or have an unknown etiology. Viral and bacterial infections cause most exacerbations, whereas atypical bacteria are a relatively uncommon cause (Up-to-date 2016).The choice of the antibiotic should be based on the local bacterial resistance pattern.Therefore the knowledge of bacterial flora of patients of AECOPD of that geographical area is required (Patel, 2015).Those who experience two or more exacerbations per year are often defined as “frequent exacerbators” and pose a unique challenge for management [6]. Acute exacerbations of COPD are a major cause of hospitalization, healthcare costs, morbidity, and mortality in COPD.

Hence we aimed at determining the bacteria which is predominantly responsible for AECOPD in our region. The study was also done to assess their antimicrobial susceptibility pattern of these isolates so that we can design a proper antibiotic regimen which will have a beneficial effect on the morbidity and mortality of the disease.

Aims and Objectives

1. Study of clinical profile in AECOPD patients
2. To study the type of bacterial infections in AECOPD.
3. To study the antibiotic sensitivity patterns of isolated organisms.

Materials and Methods

This is a cross sectional study comprising of 50 patients with AECOPD who got admitted in the Department of Pulmonary Medicine, Govt. Hospital for Chest and Communicable Diseases (GHCCD) affiliated to Andhra Medical College (AMC), Visakhapatnam during the period from January 2015 to September 2016.

A) Inclusion Criteria:

All clinically and spirometrically diagnosed AECOPD patients were admitted at our hospital.

B) Exclusion Criteria:

Bronchial Asthma, Lung Abscesses, Lung Cancer, Subjects who were on Antibiotic Therapy 2-3 days before hospital admission, Known case of Pulmonary Koch’s, Ischemic Heart Disease.

C) Sample Collection

Early morning samples were obtained from patients that were clinically diagnosed as AECOPD. Patients were instructed to collect deep coughed sputum into a sterile wide mouthed container with a screw cap. The samples were sent to the Department of Microbiology, AMC. Samples were labeled and numbered after their receipt in the laboratory and processed by conventional methods.

D) Sputum Culture

After collection and assessing the sputum, sample was sub cultured on the following culture plates:

1) Bloodagar-5% sheep blood agar for isolation of hemolytic organisms.

2) Chocolate agar – For Haemophilus and Neisseria species.

3) MacConkeys agar-for isolation and differentiation of Gram negative bacilli.

Identification of the Isolates

The primary isolation plates that are blood, chocolate and MacConkey's agar were first examined and a clear description of the colony growing on it was noted. A single well separated colony was identified by Gram staining and biochemical tests.

E) Antibiogram:

Antibiotic sensitivity tests of the isolates were performed on Mueller–Hinton agar plates by the disc diffusion method and also with the Minimum Inhibitory Concentration (MIC) in mcg/mL (E-strip) of different antibacterial agents against different bacteria. Sensitivity was performed using control strains of Pseudomonas ATCC 27853 and Klebsiella pneumonia ATCC 700603.

F) Statistical Analysis:

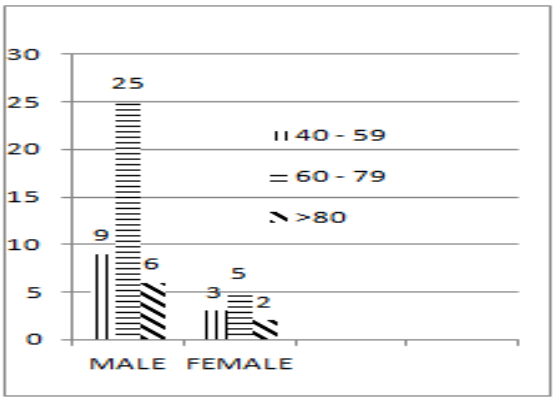
Based on age, sex, FEV1 as percent predicted, smoking habits, and bacteriological profile in sputum purulence and antibiotic sensitivity patterns.

Results

Total 50 patients were enrolled in the present study comprised of 40 males and 10 females.

Table I: Age and sex distribution in 50 patients of AECOPD

Age in Years	Males	Females	Total
40-59	09	03	12
60-79	25	05	30
>80	06	02	08
Total	40	10	50



Graph1: Age-Sex distribution in 50 patients of AECOPD

A) Age Distribution

The age group of the patient in the study, ranged from 40 to 86 years. Out of 50 patients, the most common age groups were 60-79(60%). The next common age group was 40 to 59 years (24%).

B) Sex Distribution

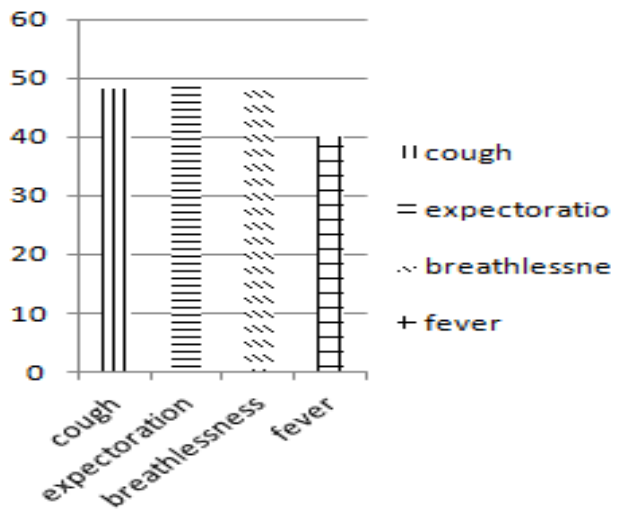
Out of 50patients, clinically diagnosed as AECOPD, 40(80%) were males and 10(20%) were females. The ratio between male and female is 4:1.

C) Symptomatology:

Predominant symptoms noted were cough [96%], Expectoration [98%]. Other symptoms noted were breathlessness [88%] and Fever [80%].

Table II: Symptoms distribution in 50patients of AECOPD patients.

Symptoms	Present	Absent	Total %(n=50)
Cough	48	02	96
Expectoration	49	01	98
Breathlessness	44	06	88
Fever	40	10	80

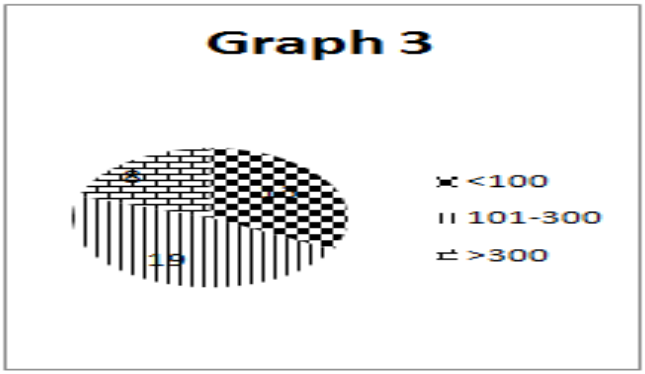


Graph 2: Symptoms distribution in 50patients of AECOPD patients.

D) Smoking Index: Out of 50 patients, 40(80%) were smokers that include 35 males and 5 females and 10(20%) nonsmokers that include males and females were 5 each. Out of 40 smokers 13(31%) patients had <100, 19 patients had 101 to 300[52%] and 08 patients had >300[17%] smoking index.

Table III: Smoking Index.

Smoking index	Males	Females	Total[n%]
<100	11	02	13[31%]
101-300	18	01	19[52%]
>300	06	02	08[17%]



Graph 3: Smoking index distribution in study population

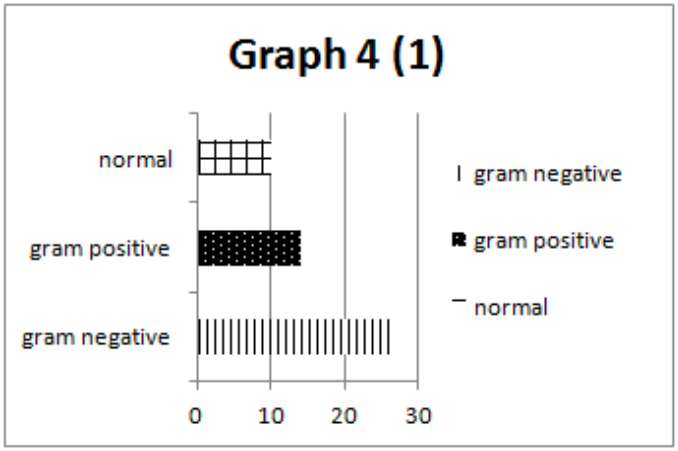
E) Spirometric Data:

Out of 50 patients, there were 14(28%) patients with moderate COPD, 33(66%) severe and 3(6%) with very severe COPD.

Table IV: Spirometric Data.

FEV1%	No of patients	% of patient
>80%	0	28%
50-80%	14	28%
30-50%	33	66%
<30%	3	6%

F) Bacteriological Profile



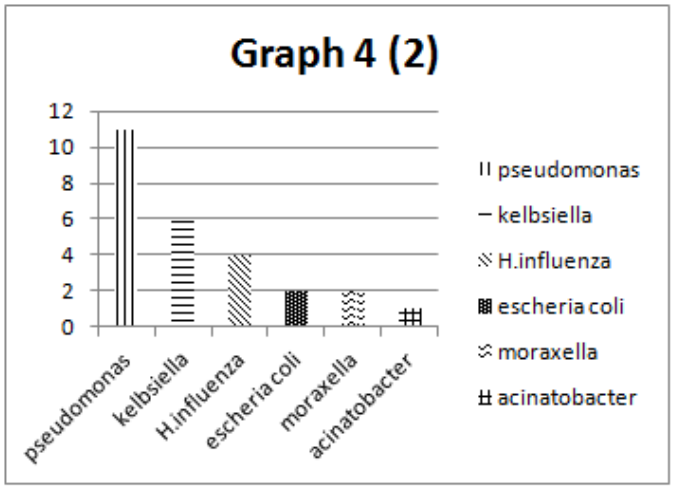
Graph4 (1): Prevalence of Gram positive and Gram negative isolates in 50 positive sputum Culture Antibiotic Sensitivity Patterns of the isolates.

Out of Fifty patients in 40 patients pathogenic bacteria were isolated, 26(52%) were Gram-negative bacteria and 14(14%) were Gram-positive bacteria. Among the 26 gram negative organism's most common pathogen isolated was Pseudomonas Aeruginosa in 11cases. Next common pathogen isolated were klebsiella in 6 cases, H. Influenza in 4 cases (Graph 4). Among the 14 gram positive patients Streptococcus Pneumoniaewas most common pathogen in 6 cases. Staphylococcus Aureus and

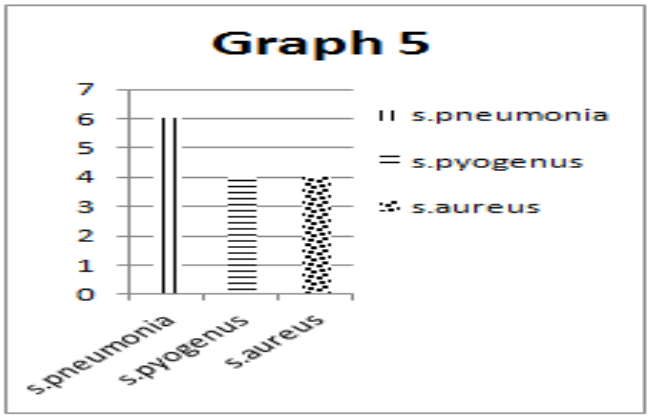
Streptococcus Pyogenes were isolated in 4 cases each. (Graph5).

G) Antibiotic Sensitivity Patterns of the Isolates:

In our study Pseudomonas was isolated in11patients. The culture and sensitivity showed that 91% were susceptible to Gentamycin, Levofloxacin and Piperacillin-Tazobactum, 81% were susceptible to Ciprofloxacin and Cefoperazone-sulbactum. 73% were susceptible to Ceftriaxone and 54% were susceptible to Amikacin. Amoxicillin was resistant in all cultures. Klebsiella was isolated in a total of 06 patients. The culture and sensitivity showed that 84 % were susceptible to Cefoperazone–Sulbactum ,Piperacillin–Tazobactum and Quinolones. 66% were susceptible to Ceftriaxone and Aminoglycosides. Amoxicillin was resistant in all cultures.Streptococcus Pneumoniae was isolated in a total of 06 patients. The culture and sensitivity shows that 100% were susceptible to Ceftriaxone, Cefoperazone-Sulbactum and Piperacillin-Tazobactum. 84% were susceptible to aminoglycosides and quinolones. 66%were susceptible to Amoxicillin. H.influenzae was isolated in a total of 04 patients. The culture and sensitivity shows that 100% were susceptible to Cefoperazone-Sulbactum. 75%were susceptible to Ceftriaxone, Piperacillin–Tazobactum and Gentamycin. 50% were susceptible to Amikacin and Quinolones. Amoxcillin was resistant in all cultures. Staph.aureus was isolated in a total of 04 patients. The culture and sensitivity showed that all were susceptible to Ceftriaxone, Cefoperazone-Sulbactum,Piperacillin-Tazobactum and Ciprofloxacin i.e 100%.75 % were susceptible to Levofloxacin. 50 % were susceptible to Amoxicillin and Aminoglycosides.



Graph 4(2): Gram negative organism distribution.



Graph 5: Gram positive organism distribution

4.8) Relation of smoking index to organism isolates: In our study patients with <100 smoking index had gram positive organisms isolated on sputum cultures whereas in patients with >101-300 smoking index had predominantly Isolated gram negative organisms. (Table V)

Table V: Relation of smoking index to organism isolates.

Smoking Index	Gram Positive	Gram Negative	Normal Flora
<100	06(15%)	05[12.5%	02[5%
101-300	04[10%]	11[27.5%]	01[2.5%]
>300	01[2.5%]	08[20%]	02[5%]

Table VI: Distribution of organisms by classification airflow limitation severity in COPD.

Study groups	Number of patients	Stage1 (FEV1 50-80%)	Stage2 (FEV1 30-50%)	Stage (FEV1 <30)
Group I	14	6	8	0
Strep.Pneum.	6	3	3	0
Staph. Aureus	4	1	3	0
Strep.Pyogenes	4	2	2	0
Group II	6	1	5	0
H.Influenzae	4	1	3	0
M.Catarrhalis	2	0	2	0
Group III	20	1	16	3
P.Aeruginosa	11	0	8	3
Klebsella	6	1	5	0
E.Coli	2	0	2	0
Acinobacter	1	0	1	0

Discussion

AECOPD is a major cause of hospital admission and health care utilization. They have a major impact on the quality of life of patients with different conditions. Fifty patients were included in our study; the mean age of patients was 63 years. Bacterial infection in AECOPD was seen more in the age group 60-79 years [7]. AECOPD was more common in men with ratio of 4:1[8] 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.

In our study in AECOPD patients sputum culture was positive in 80% which was similar to the study done by Patel et al(2015)[9] that had found 82% of positive sputum culture which is higher as compared to other studies (Ko et al,2008)[10]. The difference may be because of the fact that culture positivity depends on nature of sputum, time of collection of sputum and previous antibiotic use.

Gram negative organisms predominantly isolated were 52% while Gram positive organisms accounted for 14%. This shows the similarity with other studies that were reported the predominance of Gram negative bacteria (Madhavi et al., 2012[11] and Viswambhar et al.,2011[12]). Among the Gram negative organisms isolated, Pseudomonas Aeruginosa was the commonest isolated organism followed by KlebsiellaPneumoniae and Streptococcus Pneumoniae[13]. This finding is similar to other studies reported by Chawla*et al.* (2008)[14] who had found Pseudomonas Aeruginosa as the common organism isolated, This finding is contrary to other studies reported while Madhavi*et al.* (2012) had found Klebsiellapneumoniae as the most common organism, Patel AK et al (2015) found Streptococcus Pneumoniae as the common organism. The difference may be because most of the cases in our study were moderate to severe COPD patients. Sensitive drugs for Gram negative isolates were Amikacinand Cefoperazone-Sulbactum and sensitive drugs for Gram-positive isolates were PipercillinTazobactum, Azithromycin and Cefotaxime.Health education is a must to highlight the dangers caused by smoking and environmental pollution [15]. To study the epidemiology, etiology & complications due to bacteria in AECOPD sputum culture is a good and simple tool.

There is a need to develop a correct treatment protocol to combat against AECOPD following antibiogram and proper 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 behavior,

accessibility to health care and presence of co-morbid conditions contribute to the severity of AECOPD.

Comparing with the other studies conducted in other parts of the country, there is a reflection of changing patterns of antibiotic sensitivity and bacteriological profile.It has constantly observed that admissions to COPD patients increased on days with high pollution levels. Other risk factors that are likely to be relevant in the development of COPD are occupation, low socio economic status, diet and possibly some environmental exposures in early life. Therefore the knowledge of bacterial flora in AECOPD patients of that geographical area is required.

Conclusion

Pseudomonas Aeruginosa was still the most common pathogen in patients with AECOPD of this area and Piperacillin+Tazobactum and Levofloxacin were the most effective antibiotics. There have been significant advances in our understanding of etiology of AECOPD. Frequent exacerbations appear to be associated with worsening health outcomes and effort should focus on prompt effective treatment of each episode. Better and more specific approaches to boosting immune competence are currently under study. Further studies are required to formulate an antibiotic policy at regular intervals.

References

[1]. Global initiative for chronic obstructive lung disease (GOLD), Global strategy for the diagnosis, management, and prevention of COPD. (Updated 2017).

[2]. Sharan, H. Aerobic Bacteriological Study of Acute Exacerbations of Chronic Obstructive Pulmonary Disease. J. Clin. Diag. Res., 2015; 9(8): DC10–DC12 doi:10.7860/JCDR/2015/ 14515.6367.

[3]. Chawla, K., Mukhopadhay, C., Majumdar, M., Bairy, I. Bacteriological profile and their antibiogram from cases of acute exacerbations of chronic obstructive pulmonary disease: A hospital based study. J. Clin. Diag. Res., 2008; 2: 612–616.

[4]. Miravitlles M. Exacerbations of chronic obstructive pulmonary disease: when are Bacteria important? EurRespir J Suppl.2002; 36: 9s–19s.

[5]. Neil Macintyre and Yuh Chin Huang; Acute exacerbations and respiratory failure inCOPD; Procamthoracsoc. 2008; vol 5;530-535.

[6]. V. Courtney Broaddus , Robert J. Mason, Joel D. Ernst, Talmadge E. King Jr., Stephen C. Lazarus, John F. Murray, Jay A. Nadel et al, Murray &Nadel's Textbook of Respiratory Medicine, 6th ed, Philadelphia, Elsevier Saunders, 2016, p.784.

[7]. Jindal S.K.,A.N.Aggarwal, D.Gupta."AReview of Population Studies from India to Estimate National Burden of Chronic Obstructive Pulmonary Disease and Its Association with Smoking." Indian J Chest Dis. Allied Sci. 2001; 43:139-147.

[8]. Eller Jorg, AnjaEdeetal."Infective Exacerbaions of Chronic Bronchitis." CHEST. 1998; 113: 1542- 1548.

[9]. Patel AK, Luhadia AS, Luhadia SK. Sputum Bacteriology and Antibiotic Sensitivity Pattern of Patients Having Acute Exacerbation of COPD in India – A Preliminary Study. J PulmRespir Med. 2015;5:238.

[10]. Ko, F.W., Hui, D.S., Lai, C.K. 2008. Worldwide burden of COPD in high- and low-income countries. Part III. Asia-Pacific studies. Int. J. Tuberc. Lung Dis., 12: 713–717.

[11]. Madhavi, S., Rama Rao, M.V., JanardhanRao, R.. Bacterial etiology of acute exacerbations of chronic obstructive pulmonary disease. J. Microbiol. Biotechnol. Res., 2012; 2(3): 440–44.

[12]. Viswambhar, V., Vishnusharma, M., Harsha, D.S., Cholas, S., Sowjanya, Anupama, N. Gram negative bacterial pathogens and their sensitivity pattern in patients with acute exacerbation of chronic obstructive pulmonary

disease. Res. J. Pharma. Biol. Chem. Sci., 2013; 4(2): 1549–59.

[13] Niederman Michael S.“antibiotic Therapy of Exacerbations of Chronic Bronchitis.” Seminars in Resp. Inf. 2000; Vol.15, No.1 (March): 59-70.

[14]. Chawla K, Mukhopadhay C, Majumdar M, Bairy I. Bacteriological profile and their antibiogram from cases of acute exacerbations of chronic obstructive pulmonary disease: A hospital based study. Journal of Clinical and Diagnostic Research. 2008; 2: 612-6.

[15]. AntoJ.M.,P.Vermeireetal.“Epidemiology of Chronic Obstructive Pulmonary Disease” Eur. Respir J. 2001; 17: 982-993