ORIGINAL ARTICLE

Clinical Profile and Microbiological Spectrum in Acute Exacerbation of Chronic Obstructive Pulmonary Disease

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ABSTRACT

Background: Exacerbations are a prominent feature of the natural history of COPD, Microbiological spectrum of acute exacerbations of COPD patients, which is most often infectious and related to a viral and/or bacterial infection remains debatable. The study was conducted to know the clinical profile and Microbiological Spectrum in Acute Exacerbations of chronic obstructive pulmonary disease.

Methodology: In this cohort prospective study 90 COPD patients presented with AECOPD were enrolled to determine the incidence of infective exacerbations, their respective microbiological spectrum, antibiotic sensitivity, incidence of MDR cases and management with antibiotic stewardship. Study period was between March 2018 to March 2019. A detailed history and examination were done. The sputum specimens were collected using sterile containers and subjected to Gram's stain, culture on blood agar.

Results: Out of 90 patients admitted with AECOPD, 84 males. Only 54(60%) had infective exacerbation, among them 50 were males and mean age of was 62 years. Sputum culture showed Gram negative bacilli in 25.9%, Gram positive Cocci in 11.1%, one or two isolates in 37%, Mixed flora in 33% and no growth in isolates 29.7%. The commonest organism was Klebsiella pneumonia 6 (11.5%) followed by pseudomonas aeruginosa 4 (7.4%). Gram negative isolates were sensitive to carbapenems (100%), CSE-1034 Antibiotic Adjuvant Entity (AEE-100%), followed by amino-glycosides. MDR strains were found in 28.6% of the gram-negative organisms and 7.4% of total cases. The most common symptoms were coloured sputum 48/54 (89%) followed by dyspnoea 44/54 (81%). The presence of pneumonia was only in 22% cases.

Conclusion: Gram negative bacteria were more frequently isolated in our study. Early antibiotic therapy based on culture and sensitivity with Antibiotic stewardship in the form of Right Drug, Right dose, Descalation as per culture -sensitivity with appropriate duration, should be started to reduce increasing burden of MDR and ESBL strains.

Keywords: Chronic obstructive pulmonary disease; MDR strains; Infective exacerbations; Microbiological spectrum

INTRODUCTION

Chronic obstructive pulmonary disease is a group of progressive, debilitating respiratory conditions including emphysema and chronic bronchitis characterized by difficult breathing, lung air flow limitations, cough and other symptoms.[1] The clinical course of COPD is punctuated by acute exacerbation defined as "a sustained worsening of the patient condition from the stable state and necessities a change in regular medication in a patient with underlying COPD.[2] The cause of an Acute exacerbation COPD is most often infections and related to a viral and/or bacterial infection.[3] The predictor of an exacerbation in any given patient appears to be a history of previous exacerbations.[4] The mean number of exacerbations/years has been repeated to be 2.3 in mild to moderate COPD, Compared to 3.2 for patients for more severe disease.[5] Haemophilus influenza is the most frequently bacterium isolated in all series followed by S. Pneumoniae and moraxellacatarrhalis.[6] Other organisms are Pseudomonas and Klebsiella.[7]. Several recent studies have reported the presence of MDR bacteria at hospital admission in patients with severe acute exacerbation COPD.[8] Non fermenting Gram-negative bacilli including Pseudomonas Aeriginosa, Acinetobactor Baumani are most frequently isolated multi drug resistance bacteria in severe COPD excarbation.[9] MDR bacteria were defined as ceftazidine or Imipenem resistant P. Aeurigenosa and ESBL Gram –ve bacilli.[10]

OBJECTIVES

The goal of study was to assess the incidence of infective exacerbations, Microbiological spectrum in

acute exacerbation of COPD and antibiotic sensitivity and incidence of MDR cases.

METHODOLOGY

This Cohort prospective observational study was conducted in General Medicine department of KDMCH, Mathura and enrolled 90 COPD patients having acute exacerbation admitted over a period of one year.

Inclusion criteria: All COPD patients diagnosed according to GOLD[11] and having manifestations of infective exacerbations like Worsening of COPD symptoms for ≥ 2 consecutive days based on a patient report of worsening of at least 2 major symptoms (Dyspnea, sputum volume and /or sputum color) or the occurrence of at least one minor symptom (sore throat, coryzal symptoms) otherwise unexplained fever and /or worsening cough or wheeze[12] were included in the study.

Exclusion criteria: OPD patients, cases with evidence of bronchiectasis, cases treated with any antibiotic within 48 hours before admission or cases required mechanical ventilation were excluded.

For all patients the following was obtained;

a) History and examination
b) Radiology –Chest X ray.
c) Other diagnostic and radiological procedures for assessment of the condition or to exclude other diagnosis.
d) Complete blood picture to assess the total leukocyte count and differential count.
e) Morning sputum sample in a sterile container for culture sensitivity collected within the first 48 hrs. of admission after noting the physical properties of sputum.
f) Direct film by Gram strain and routine sputum culture on blood agar, chocolate agar, MacConkey media. The antibiotic impregnation discs were placed on freshly prepared lawn of bacterial isolate and incubated at 35 ± 1°C for 24 hours. A reliable specimen with epithelial cells lower than 10 per 100x Field[13] was considered.

RESULTS

This cohort prospective observational study included 90 COPD patients with AECOPD; 84 males and 6 females. 54(60%) patients out of 90 COPD patients had infective exacerbations (Table 1).

The mean age of COPD cases with infective exacerbation in our study was 62 years (Table 2) which may be due to the fact that chronic bronchitis has highest prevalence in fifth and sixth decade. The gender distribution Male: Female was 50:4, because smoking habits are more pronounced in males (Table 2).

Table 1: Study population

Total number of patients	90
Patients with infective exacerbation	54(60%)

Table 2: Demographic data

Male: Female	50:4
Smokers: Non- smokers	50:4
Mean age in years	62

Table 3: Clinical, laboratory and radiological findings

Findings	Cases (n=54) (%)
Fever	28 (52)
Dyspnea	44 (81.5)
Colored sputum	48 (89)
Increased sputum viscosity	10 (18)
Increased TLC	18 (33)
Radiological evidence of pneumonia	12 (22)

Table 4: Cultures

Isolate	Cases (n=54) (%)
Gram positive cocci	6 (11.1)
Gram negative bacilli	14 (25.9)
Mixed flora	18 (33.3)
No growth	16 (29.7)

Table 5: Percentage of gram-negative organisms in cultures

Organism	Cases (n=54) (%)
K. pneumonie	6 (11.1)
P. aeruginosa	4 (7.4)
A. baumanni	1 (3.7)
E.coli	1 (3.7)
Others	3 (6.8)

Table 6: Pattern of drug sensitivity in gram negative organisms

Organism	P	C1	C2	C3	A	Q	TS	PB	C
K. P	R	R	S	S	S	S	R	R	S
P.A esbl	R	R	R	R	S	S	S	S	S
P. A	R	R	S	S	S	R	R	R	S
P.A/AB	R	R	R	S	R	R	R	R	S
KP esbl	R	S	R	R	S	S	R	S	S
AB	R	R	R	S	R	R	S	S	S
E.Coli	R	R	R	S	S	S	R	S	S

KP-Klebsiela pneumonie, PA- Pseudomonas aeruginosa, AB- Acinetobacter baumanni, P-pencillins, C- Cephalocephorins (1,2,3-Generations), A-Aminoglycosides, Q- flouroquinolones, PB- Polymixin B, C- Carbapenems

The most common symptoms were coloured sputum 48/54 (89%) followed by dyspnoea 44/54 (81%) (Table 3). Increased TLC was not predominant in most cases in our study was 33%. The presence of pneumonia was only in 12/54 cases representing 22%.

Cultures with one or two isolates appeared in 20/54 cases representing 37%. Gram negative bacilli was found in 14/54 specimens representing 26%. (Table 4)

The most common organism was K. pneumonia 6/14 representing 11.1% followed by p. aeruginosa4/14 representing 7.4%. Other organisms were A. baumanni 1/14 and E. coli 1/14. (Table 5)

The antibiotic sensitivity showed 100% resistance to pencillins, minimal resistance to AMGs, 14.3%, 57% to flouro-quinolones and 100% sensitivity to carbapenems and CSE-1034 (ceftriaxone + sulbactum + EDTA). Regarding the third-generation cephalosporin a resistance of 28.6% of total gram-negative organisms, 7.4% of patients and 20% of all the cultured bacteria thus they are considered as MDR strains. The resistant isolates were ESBL producing pseudomonas and klebsiella. In our study these bacteria were found in 8% patients and represented 24% of all isolated bacteria. (Table 6)

DISCUSSION

A cohort prospective observation study started in March 2018 for one year in General medicine department KDMCH, Uttar Pradesh and included COPD patients admitted with acute exacerbation and fulfilling the inclusion and exclusion criteria. Ninety COPD patients were admitted to the general medicine department where 54 patients (60%) considered as having AECOPD. The diagnosis of acute infective exacerbation was based on the presence of fever, changes in the sputum characters, increased TLC and /or radiological evidence of pneumonia. The percentage of infective exacerbation was 60%, it was found concordant with mentioned range 50%-70% given by Ball[14] and Lode et al (62.3%)[15].

The mean age of COPD cases with infective Exacerbation in the current study was 62.1 years due to the fact that chronic bronchitis has high prevalence in fifth and sixth decade [16]. More ever the known mean age was around 70 [17, 18].

The gender distribution: male: female 50:4 with a female percentage 7.4%, because smoking habits are more in males [16]. However, it is now known that COPD has increasing prevalence among women [19]. And it may reach even more than half the population of the AECOPD requiring hospitalization (53.9%) in some studies[20].

Increased TLC was not predominant in most cases in the current study 33.3%. Some studies disagreed that WBC elevates in COPD, because it was found a normal TLC[21]. On the other hand, Sin et al stated that TLC were elevated in a directly proportional manner with severity of AECOPD[22]. due to the systemic inflammatory burden[23].

The presence of pneumonia was only in 12/54 cases representing 22.2%. There IS debate over whether people with AECOPD and coexistent pneumonia should be included in the definition of AECOPD. However pulmonary consolidation was not exclusion in the major UK national audits of COPD exacerbations [24]. COPD exacerbations that are associated by radiographic consolidation have the same disease when compared with non-pneumonic exacerbations [25]. It may represent a percentage range from 8% [26] to 33%[27].

Cultures with one or two isolates appeared in 20/54 cases with a percentage 37%. Different percentages of cultured organisms appeared in similar studies like 38.29%[17], 46%[28], 55%[16], 56%[27], 65%[18]. Culture positivity depends on the nature of sputum, transportation time and the number of organism present in the sample[29].

Gram negative bacilli outnumbered the growth of other organisms. The cultured gram-negative bacilli were found in 14 out of 54 patients with a percentage of 25.9%. However, it was found 53.3% in other study[18], 34% in other one [16]. The most common is k. pneumonie 6/14 with a percentage of 30% like Ferrer et al [30], compared to 25% in Chawla et al[29].

Another gram-negative isolate was A. baumanii, which was found alone in 1 case (10%) compared to 7.8% in ye et al[31].

The antibiotic sensitivity showed 100% resistance to pencillins, minimal resistance to aminoglycosides 14.3% and considerable resistance to FQs 57% and 100% sensitivity to carbapenems. Regarding the third-generation cephalosporin a resistance of 28.6% of the total gram negative organisms7.4% of patients and 20% of all cultured bacteria this they were MDR organisms.[10] the resistant isolates were ESBL producing pseudomonas and klebsiella. Carbapenems are considered to be the antibiotics of choice for ESBL infections [32]in other studies these bacteria were found in 8% of patients and represented 24% of all Bacteria[10].

CONCLUSION

Klebsiella and pseudomonas are the most common sputum pathogens in hospitalized patients with AECOPD·Carbapenems, ELORES followed by AMGs were the most active antibiotics and therefore DOC in treating AECOPD in our setting. The num-

ber of MDR strains causing AECOPD are increasing, so antimicrobial sensitivity pattern must be checked for the causative agent.

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