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Research Article

HOSPITAL BASED CROSS SECTIONAL STUDY ON BACTERIOLOGICAL ISOLATES OF ACUTE EXACERBATION OF CHRONIC OBSTRUCTIVE PULMONARY DISEASE PATIENTS

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ABSTRACT

Background: Chronic obstructive pulmonary disease (COPD) is a group of disorders characterized by permanent or minimally reversible expiratory airflow limitation, and includes chronic bronchitis and emphysema. One of the common symptoms of COPD is the development of episodes of acute worsening of respiratory functions which cause severe breathlessness and is termed as acute exacerbations of COPD. Several factors influence the natural course of the disease including the contribution of bacterial infections in causing acute exacerbations by infecting the lower respiratory tract. Methodology: This cross-sectional study was carried out from July 2016 to July 2017 in the department of Microbiology, SKIMS Medical College. A total of 104 patients fulfilled the inclusion criteria were included in the study. Demographic data, anthropometric data, and clinical data were recorded on a pretested questionnaire. All the patients were subjected to sputum examination which included culture and antibiotic sensitivity. Results: The mean age of the studied patients was 50.9 ± 18.9 years with the disease most prevalent in the age group of > 55 years where the prevalence was 66%. Most of the studies patients were males 60(57.7%) of which 51(85%) were smokers. 28(26.9%) patients had growth of normal flora on the sputum culture while Gram positive and Gram Negative organisms were isolated in 20(19.2%) and 17(16.3%) patients respectively. On Antibiotic sensitivity tests only 9(8.7%) sample was sensitive to Ciprofloxacin, Levofloxicin, Amikacin, Ofloxcin, Imepenum, Pipercillin, Gentamycin, Co-trimoxazole while 6(5.8%) samples were sensitive to Linezolid , Vancomycin, Ceftriaxone, Cefotaxime and Amoxy-clavulinic acid. Conclusion: AECOPD is one of the common lung disorder encountered in clinical practice and sputum culture and sensitivity is one of the good and less expensive methods to study the etiology and associated conditions with AECOPD. Antibiotic sensitivity also helps in determining antibiotic protocol treatments in patients with AECOPD for better prognosis and reducing morbidity and mortality associated with the disease.

INTRODUCTION

Chronic obstructive pulmonary disease (COPD) is a group of disorders characterized by permanent or minimally reversible expiratory airflow limitation and includes chronic bronchitis and emphysema. The chronic obstructive pulmonary disease is the most common respiratory disorder encountered in clinical practice. It constitutes 30% of cases seen in chest clinics and accounts for 1-2.5% admissions in hospitals all over India (1). Smoking a major risk factor for the development of COPD causes 85-95% of cases(2). Other causes are attributed to genetic factors including alpha 1-antitrypsin deficiency, passive smoking, occupational exposures & air pollution (2).

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Patients with chronic bronchitis often complain of persistent airway obstruction that leads to dyspnoea and a productive cough. Chronic bronchitis is clinically defined as the presence of a recurrent productive cough for 3 months of the year in 2 consecutive years (3). In emphysema, there is hyperinflation of the lung. The elastic fibers of the alveoli and distal air spaces that provide the elastic recoil powering expiration are destroyed. In both the variants of COPD, the sign and symptoms of patients are more or less same including a cough, sputum production, breathlessness, airflow limitation and impaired gaseous exchange. They too have deranged pulmonary function tests. One of the common symptoms of COPD is the development of episodes of acute worsening of respiratory functions which cause severe breathlessness and is termed as acute exacerbations of COPD. The episodes of exacerbations occur more frequently with the progression

of the disease itself. These episodes are major causes of morbidity and mortality among patients with COPD.

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 (4). The severity of AECOPD without respiratory failure can be classified traditionally according to Winnipeg criteria. The three-stage system is based on three principal symptoms (1):

1. Increase in sputum volume
2. Increase in sputum purulence
3. Increase in shortness of breath

Acute exacerbation of COPD showed a hospital mortality rate of 24% if the patient required ICU admission. This mortality rate increased to 30% if the patient was above 65 years (5).COPD is a major public health problem in both rural and urban areas where the prevalence varies from 1% in urban nonsmoker to 21% in rural smokers (6).The morbidity and mortality associated with this disease have led to an extensive research all over the world. Several factors influence the natural course of the disease including the contribution of bacterial infections in causing acute exacerbations by infecting the lower respiratory tract. Major organisms include respiratory viruses, atypical bacteria, and aerobic Gram-positive and Gram negative bacteria. The relative contributions of these bacterial classes in exacerbation of COPD have been in controversy for several decades (7). With the increasing use of modern diagnostic techniques like fiber optic bronchoscope, newer sampling methods like Trachea Bronchial Aspirated Sample (TBAS), Broncho Alveolar Lavage Fluid (BALF), and Protected Specimen Brushing (PSB) (8), the role of bacteria in COPD has been clearly understood.With this aim, we conducted this study to find the common type of bacterial infection in acute exacerbation of COPD disease and the antibiotic sensitivity patterns of isolated organisms in patients attending a tertiary care hospital of Kashmir valley.

METHODS

This cross-sectional study was carried out from July 2016 to July 2017 in the department of Microbiology, SKIMS Medical College, Bemina which is a tertiary care hospital located on the outskirts of District Srinagar. Patients admitted to the medicine ward that gave written informed consent and was diagnosed by the attending clinician as a case of acute exacerbation of COPD were included in the study. Patients with known history of pulmonary Koch's or bronchial asthma, lung abscesses and lung carcinoma were excluded. Further patients on antibiotic therapy were also excluded. A total of 104 patients fulfilled the inclusion criteria and were included in the study. Demographic data, anthropometric data, and clinical data were recorded on a pretested questionnaire. Variables like age, sex, history of smoking, socioeconomic status, weight, height, BMI & other clinical sign symptoms of the patient were recorded. All the patients were subjected to sputum examination which included culture and antibiotic sensitivity. After collection of sputum sample, it was cultured on 5% sheep blood agar for isolation of haemolytic organisms, on Chocolate agar for Haemophilus and Neisseria species and on MacConkey's agar - for isolation and differentiation of Gram negative bacilli. The inoculated plates were then incubated for 24 hours and were examined for evidence of bacterial growth. A report of no growth after 24 hours of incubation was dispatched to the concerned department in case of samples with no evidence of bacterial growth. Plates with bacterial growth were further examined using Grams staining, Hanging drop, Catalase test, Oxidase test, Indole, Methyl red test, Voges Proskauer test, Citrate utilisation test, Urease production, Hydrogen sulfide production, Sugar fermentation test, Nitrate reduction test, Coagulase production, Bile solubility test, Blood agar - Bacitracin and optochin sensitivity. Antibiotic sensitivity test of the isolates was performed on Mueller-Hinton agar plates by the disc diffusion method of Kirby-Bauer. Before using, the plates were dried for 10-30 minutes at 37°C by placing them in an upright position in the incubator or with lids tilted. After the plates were dried broth suspension of the organisms was made and adjusted to McFarland's opacity factor 0.5. A lawn culture was made over the surface of the media using a sterile swab, then appropriate antibiotics disc were placed and incubated at 37°C for 24 hours after which reading was taken. The zone of inhibition was measured and reported. Sensitivity was performed using control strains of Klebsiella pneumoniae ATCC 700603, Staphylococcus aureus ATCC 25923, E. Coli ATCC 25922 and Pseudomonas ATCC 27853.

RESULTS

This cross-sectional study was carried out in Department of Microbiology, SKIMS Medical College, Bemina on 104 patients who were referred from the Medicine Department of SKIMS Medical college for sputum examination. All 104 cases were clinically diagnosed as AECOPD by the attending clinician. Microbial Isolated were analyzed and antibiotic sensitivity was carried out on all the 104 sputum samples. The mean age of the studied patients was 50.9 ± 18.9 years with the disease most prevalent in the age group of > 55 years where the prevalence was 66%. Most of the studies patients were males 60(57.7%) of which 51(85%) were smokers. No history of smoking was reported by female patients. 45(43.3%) subjects were illiterate and 60(57.7%) belonged to Upper Middle (II) class of socioeconomic status. The mean height and weight of the patients were 1.64 ± .08 meters and 68.93 ±3.2 Kgs. The mean BMI of the patients was 25.6 ± 3.04 Kgs/m2. 28(26.9%) and 27(26.0%) of studied patients were hypertensive and diabetics and were on treatment (Table I).

Table II shows organisms isolated from the sputum of AECOPD patients. 28(26.9%) patients had growth of normal flora on the sputum culture while Gram positive and Gram Negative organisms were isolated in 20(19.2%) and 17(16.3%) patients respectively. On Antibiotic sensitivity tests only 9(8.7%) sample was sensitive to Ciprofloxacin, Levofloxacin, Amikacin, Ofloxacin, Imepenum, Piperacillin, Gentamycin, Co-trimoxazole while 6(5.8%) samples were sensitive to Linezolid, Vancomycin, Ceftriaxone, Cefotaxime and Amoxy-clavulanic acid (Table III).

DISCUSSION

A total of 104 Patients who reported to the medicine department with acute exacerbation of COPD and who were advised for sputum culture and sensitivity were included in this study. It was observed that the mean age of the patients

was 50.9 ± 18.9 years with the maximum number of patients reporting to the medical unit with AECOPD in the age group of 55 years and above. It may be due to the fact that these patients were long term smokers and had developed full blown COPD with exacerbations. Narayanagowda DS *et al.* (9) reported that the disease itself has a major impact on the patient's quality of life and increased hospital admissions with the advancing age. Moreover, the disease itself in advanced stages decreases the lung host defenses at the bronchial mucosal level (10). Further, it was seen that 57.7% male patients reporting with AECOPD with the male female ratio of 1.36:1, which is not in accordance with other studies reported earlier (11). Smoking behavior was observed in 85% of male patients and all female patients were non-smokers. This may be due to high rates of smoking behavior seen in Kashmiri males. Jindal SK *et al.* in their study also reported high prevalence of smoking in males with AECOPD (12). Almost half of the studied patients were illiterate and lack of knowledge about preventive health care may have attributed them to continuous smoking behaviors. Further, it was observed that 57.7% belonged to Upper Middle (II) class of socioeconomic status which further increases their risk of non-communicable diseases and behaviors like smoking. In this study, one fourth of the study patients also reported being on antihypertensive and antidiabetic drugs which further increase their risk to recurrent lung infections. Examination of sputum samples: The prevalence of normal flora in the sputum samples was 26.9%. Gram positive Cocci were found to be in 25% and Gram negative Cocci in 36.6% sputum samples respectively. Jindal SK *et al.* (12) too have reported the presence of Gram positive and Gram Negative isolates in sputum of patients with severe lung diseases or exacerbations of COPD. Among the isolates, S.Pneumoniae was seen in 8.7% samples, P.Aeruginosa 8.7%, S.Aureus in 5.8%, Yeast in 4.8%, Candida Albicans in 2.9% and Pneumococcus in 3% respectively. The drug sensitivity reveals that only 8.7% of the sputum isolates were sensitive to Ciprofloxacin, Levofloxicin, Amikacin, Ofloxcin, Imepenum, Pipercillin, Gentamycin, and Co-trimoxazole. Whereas 5.8% isolates were sensitive to Linezolid, Vancomycin, Ceftriaxone, Cefotaxime and Amoxy-clavulinic acid. 85.6% of samples were resistant to the above-mentioned drugs. These findings are not in accordance with the previous studies as reported by Patel AK *et al* and Chawla K *et al.*

CONCLUSION

AECOPD is one of the common lung disorder encountered in clinical practise and sputum culture and sensitivity is one of the good and less expensive method to study the aetiology and associated conditions with AECOPD. Antibiotic sensitivity also help in determining antibiotic protocol treatments in patients with AECOPD for better prognosis and reducing morbidity and mortality associated with the disease. Risky behaviour like smoking and co-morbid conditions like hypertension and diabetes also add to the burden of disease morbidity. It is highly recommended to clinicians to ask for sputum culture and sensitivity in patients with AECOPD. The indiscriminate use of antibiotics should be restricted and strict laws should be enforced to reduce smoking behaviour in people.

Table I Demographic Characteristics of patients with AECOPD

Variable		Frequency (n)	Percent (%)
AGE (In Years)	≤35	7	6.8
	36-55	28	26.9
	56-66	33	31.7
	≥67	36	34.6
	Total	104	100.0
SEX	Male	60	57.7
	Female	44	42.3
	Total	104	100.0
TOBACCO USE	Smoker	51	49.0
	Non-Smoker	53	51.0
	Total	104	100.0
EDUCATIONAL STATUS	Illiterate	45	43.3
	Primary School	6	5.8
	Middle School	7	6.7
	High School	16	15.4
	Higher Secondary	21	20.2
	Graduate	7	6.7
	Postgraduate	2	1.9
	Total	104	100.0
SOCIOECONOMIC STATUS	Upper (I)	12	11.5
	Upper Middle (II)	60	57.7
	Lower Middle (III)	24	23.1
	Upper Lower (IV)	8	7.7
	Total	104	100.0
CO-MORBID CONDITIONS	Hypertensive	28	26.9
	Non-Hypertensive	76	73.1
	Total	104	100.0
	Diabetic	27	26.0
	Non-Diabetic	77	74.0
	Total	104	100.0

Table II Organism Isolates from the sputum culture of AECOPD Patients

	Frequency	Percentage
Normal flora	28	26.9
Gram Positive Cocci	20	19.2
Gram Negative Cocci	17	16.3
S. pneumoniae	9	8.7
P. aeruginosa	9	8.7
S. aureus	6	5.8
Yeast	5	4.8
Candida Albicans	3	2.9
Pneumococcus	3	2.9

Table III Antibiotic Sensitivity of Isolates from Sputum of AECOPD Patients

	Antibiotic Sensitivity	No.of Isolates	Percentage
1	Ciprofloxacin, Levofloxacin, Amikacin, Ofloxacin, Imepenum, Pipercillin, Gentamycin, Co-trimoxazole	9	8.7
2	Linezolid, Vancomycin , Ceftriaxone, Cefotaxime, Amoxy-clavulinic acid	6	5.8
3	None	89	85.6

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