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Bacteriological Study of Chronic Obstructive Pulmonary Disease

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Chronic Obstructive Pulmonary Disease (COPD) constitutes 30% of cases in chest clinics and accounts for 1 to 2.5% admissions in hospitals all over India. COPD is a spectrum of disorders that results in air flow obstruction. Precise role of bacteria will help the clinical practitioner in managing COPD cases effectively. Early morning sputum samples were obtained from the patients. Bacterial identification and its antibiogram were done by standard conventional methods. Incidence of COPD was 4.33% with male of female ratio 2.95:1. Pathogenic bacteria were isolated in 195 samples (72.5%) whereas commensals were isolated in 74 samples (27.5%). Among the 195 samples, single bacteria were isolated in 187 samples and in 8 samples polymicrobial etiology were noted. Bacterial infection in Chronic Obstructive Pulmonary Disease is a major cause of morbidity and mortality in both the developed and developing countries. The bacteriological profile COPD is constantly changing with advanced diagnostic techniques .The bacterial isolation rate also improved due to appropriate sample collection and Bartlett's grading of sputum. Knowledge of the microorganisms in COPD along with their antibiotic sensitivity pattern will help in selecting suitable antibiotics for treating these infections and preventing mortality.

Key words: COPD, Pathogenic bacteria, Antibiogram.

The chronic obstructive pulmonary diseases (COPD) are the most common respiratory diseases 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.

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It is both a rural and urban health problem with prevalence varying from 1% in urban nonsmoker to 21% in rural smokers [1]. COPD is a spectrum of disorders that results in air flow obstruction. At one end of the spectrum is chronic bronchitis, which is characterized by airway inflammation, mucus hyper secretion and airway reactivity. At the other end of the spectrum is emphysema, characterized by alveolar destruction and small airway abnormalities. Air trapping and hyperinflation are common at both ends of the spectrum. In reality, most COPD patients have features of both.[2]

Several potential contributions of bacterial infection to the etiology, pathogenesis and clinical course of COPD have been identified. However the precise role of bacterial infection

COPD has been a source of controversy for several decades.

Aim of the present study is to determine the incidence of Chronic Obstructive Pulmonary Disease in the cases admitted to District hospital & K.L.E.S's Hospital & Medical Research Centre, Belgaum and to study the type of bacterial infections in chronic obstructive pulmonary disease and its antibiogram.

MATERIAL AND METHODS

Out of six thousand two hundred and nine (6209) patients admitted in the medicine wards of District Hospital and K.L.E.S's Hospital & M.R.C., Belgaum from January 2002 to December 2002 , 269 patients clinically diagnosed with Chronic Obstructive Pulmonary Disease were included in the study. Patients with prior antibiotic use and patients with clinically diagnosed cases of tuberculosis, carcinoma and immunocompromised patients were excluded from the study

Early morning sputum samples were obtained from cases that were clinically diagnosed as Chronic Obstructive Pulmonary Disease. Patients were instructed to collect deep coughed sputum specimen into a sterile wide mouth container with a screw cap[3]. Bacterial identification and its antibiogram from the sputum samples were done by the standard conventional methods. The quality of the sputum was assessed by Bartlett's grading.

RESULTS

Incidence of COPD was 4.33% with male of female ratio 2.95:1. (Table 1)

Two hundred and sixty nine (269) sputum samples were subjected to bacteriological study. Pathogenic bacteria were isolated in 195 samples (72.5%) whereas commensals were isolated in 74 samples (27.5%). Among the 195 samples, single bacteria were isolated in 187 samples and in 8 samples multiple bacteria were isolated.(Table 2,3)

Out of one hundred and eighty seven (187) single pathogenic microorganisms, Klebsiella pneumoniae was the commonest isolate followed by S*treptococcus pyogenes*, *Staphylococcus aureus*, *Pseudomonas aeruginosa* and *Citrobacter freundii*. (Table 4)

8 samples showed polymicrobial infection. The most common polymicrobial pattern were *Klebsiella pneumoniae* and *Citrobacter freundii.* (Table 5).

Klebsiella pneumoniae which was most common isolate was highly sensitive to Amikacin followed by Ciprofloxacin and Netilmicin. Streptococcus pyogenes was sensitive to Amoxycillin and Clavulanic acid . (Table 6)

Table 1. Sex distribution among copd cases

	Male	Female
Total no. of cases 269	201	68
Percentage	74.72%	25.28%
Ratio	2.95	1

Table 2. Culture positivity in copd

S. No	Bacteria	Numbers	Percentage
1	Pathogenic	195	72.5
2	Non pathogenic (commensals)	74	27.5
	Total	269	100.0

Table 3. Pattern of pathogenic isolates

Pathogenic Bacteria	Numbers	Percentage
Single pathogens	187	95.9
Multiple pathogens	8	4.1

Table 4. Distribution of bacterial isolates

S. No	Organisms	No.of cases
1	*Klebsiella pneumoniae*	65
2	*Streptococcus pyogenes*	45
3	*Staphylococcus aureus*	28
4	*Pseudomonas aeruginosa*	21
5	*Citrobacter freundii*	13
6	*Escherichia coli*	6
7	*Streptococcus pneumoniae*	6
8	*Proteus mirabilis*	3
	Total	187

Table 5. Pattern of multiple pathogens

S. No	Organisms	No.of cases
1	*Klebsiella pneumoniae + Citrobacter freundii*	1
2	*Escherichia coli + Klebsiella pneumoniae*	1
3	*Streptococcus pyogenes + Staphylococcus aureus*	2
4	*Klebsiella pneumoniae + Staphylococcus aureus*	1
5	*Pseudomonas aeruginosa + Proteus mirabilis*	1
6	*Streptococcus pyogenes + Streptococcus pneumoniae*	1
7	*Candida species + Staphylococcus aureus*	1
	Total	8

Table 6. Antibiotic sensitivity

Organisms antibiotic	*Klebsiella pneumoniae*	*Pseudomonas aeruginosa*	*E.coli*	*Proteus Mirabilis*	*Citrobacter freundii*	*Staph. aureus*	*Strep. pyogenus*
Gentamycin	80.9%	72.2%	66.66%	75%	91%	78.5%	100%
Ciprofloxacin	80.35%	53.3%	66.7%	35%	100%	80.5%	97.5%
Cefotaxime	76.27%	69%	84%	100%	85%	84%	83.7%
Amoxy. Clavulanate.	62.05%	11%	84%	-	66%	-	100%
Netilmicin	80.35%	64%	84%	67%	63%	82.3%	100%
Doxycycline	64%	30%	50%	67%	70%	70%	90%
Amikacin	94.4%	75%	100%	100%	60%	100%	100%
Co-trimaxazole	80.9%	50%	67%	67%	-	100%	100%
Oxacillin	-	-	-	-	-	84.2%	
Erythromycin	-	-	-	-	-	100%	79.5%

DISCUSSION

Bacterial infection in Chronic Obstructive Pulmonary Disease is a major cause of morbidity and mortality in both the developed and developing countries.The lungs are remarkably resistant to infection. The local defenses of the respiratory tract are sufficient to eliminate most microbial transgressions without sequelae. Infection occurs when the offending challenge overwhelm the resident defenses, leading to microbial multiplication, inflammation and immune response.[4]

The bacteriological profile COPD is constantly changing with advanced diagnostic techniques. In the present study we recorded an incidence of 4.33% of COPD cases. The incidence of COPD in previous studies has shown the range from 1 to 7% by Kamath and Jindal et.al. Probable reasons may be due to higher rate of consumption of tobacco (Tobacco chewing and Smoking) which is common in male population in our area[5,6].

In the present study, most common age group of patients with COPD is 51- 60 years. This is similar to the study made by Arora *et al.* Likely factors were 60% of the patients had a history of cigarette smoking, others were passive smokers.

Pathogenic bacteria were grown in 195 patients. Higher isolation rates of pathogenic bacteria in our study may be due to a fact that majority of the patients admitted came in later stages of the disease, as our hospital is a tertiary care hospital. The bacterial isolation rate also improved due to appropriate sample collection and Barlett's grading of sputum. One of the important problems encountered in isolation of bacteria from sputum samples is frequent contamination with normal oropharyngeal flora. Grading of sputum by Barlett's method and Gram stain of the sputum smears can be helpful in avoiding unnecessary processing of unfit samples.

In the present study, a total of 269 sputum samples were studied, Gram stain was done and

graded according to Bartlett's grading. Those samples which showed 1 or above were processed further and which showed grade 0 or grade - 1 were discarded (as unfit for processing) and one more sample was collected [7-10].

Majority of isolates in our study were gram negative coliforms as gram negative organisms have been known to colonize 'bronchitis lung' particularly in patients in whom antibiotics have suppressed the colonizer [11].

Eller *et al.*, in his study noted that the patients with an FEV 1 of 35% or less has evidence of Gram negative bacteria and most bacteria belong to Enteriobacteriaceae and *Pseudomonas* species. In our study we could not isolate Heamophilus influenzae although chocolate agar a selective medium for H. influenzae was plated with sputum in all cases. This could be attributed to prior antibiotic therapy[12].

Klebsiella pneumoniae which was the common isolate was highly sensitive to Amikacin, followed by Ciprofloxacin and Netilmicin followed by *Streptococcus pyogenes* sensitive to Amoxyclavulanate.

The patterns of polymicrobial isolation were *Klebsiella pneumoniae* and *Citrobacter freundii*, *Escherichia coli* and *Klebsiella pneumoniae* respectively.

Allegro & Grassi found significant benefit with the use of Amoxicillin and Clavulanate therapy compared with placebo in patients with severe disease. Patients who received these antibiotics exhibited a higher success rate[13].

CONCLUSION

COPD contributes to be an important cause of morbidity and mortality in both developed and developing countries emphasis should be placed in defining the contribution of bacteria in the lower airways inflammation which is a hallmark of COPD.

Knowledge of the microorganisms in COPD along with their antibiotic sensitivity pattern will help in selecting suitable antibiotics for treating these infections and preventing mortality. It would also help to avoid the indiscriminate use of antibiotics, there by preventing development of resistance to them.

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