

Common Bacterial Isolates in sputum of AECOPD Patients in Tertiary Care Centre

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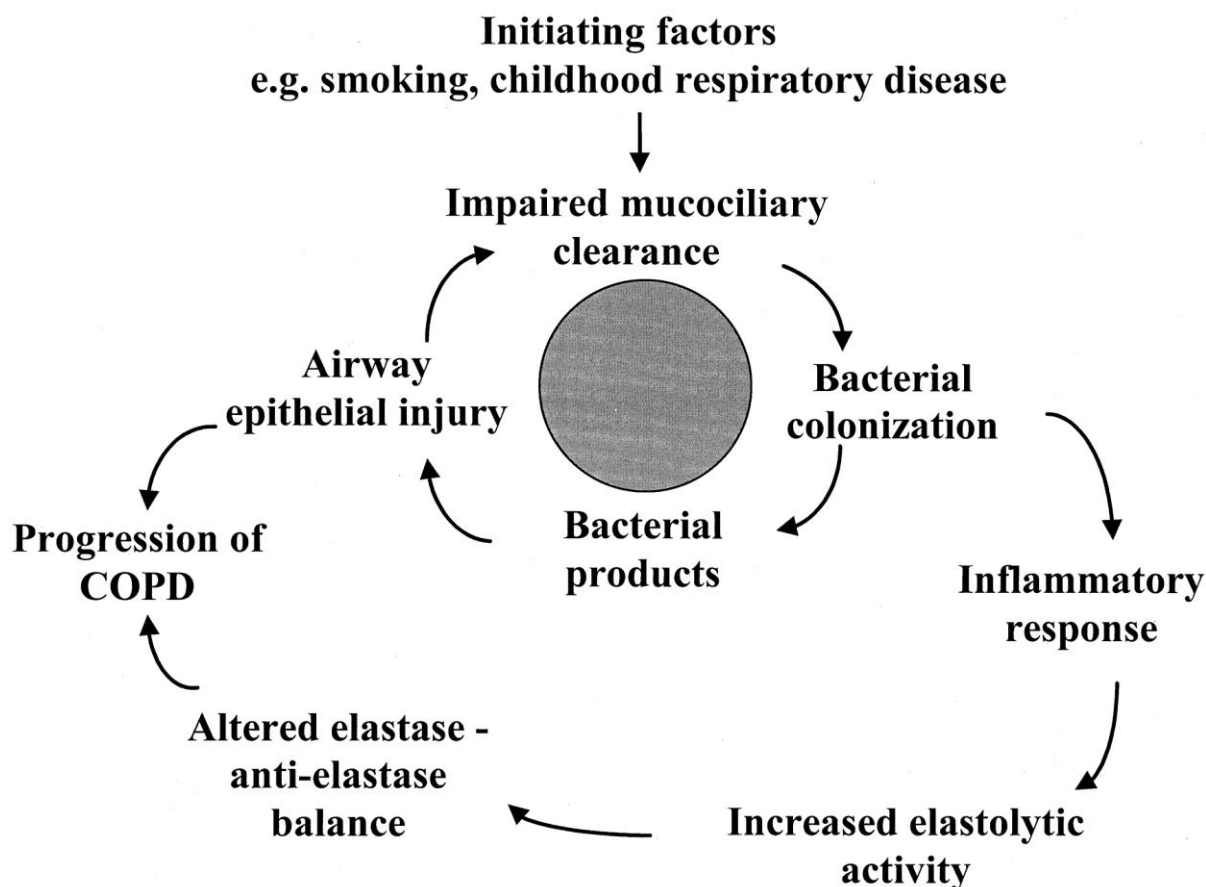
I. Introduction

Chronic Obstructive Pulmonary Disease (COPD) is a chronic inflammatory disabling disease(1). It is a spectrum of airway disease characterized by the chronic bronchitis (airway obstruction) & emphysema (parenchymal destruction)(2) . The major cause for morbidity & mortality in worldwide is COPD & it is the fourth leading cause of death in world (3,4,5). In US alone , 24 million people suffer from COPD & is the third leading cause of death(6).

COPD is an inflammatory disease with significant airflow limitation that is not fully reversible (7) & is usually progressive (3) with remissions & exacerbations as Acute Exacerbations of Chronic Obstructive Pulmonary Disease(AECOPD) . Airflow limitation is caused by both airway obstruction & parenchymal destruction .An exacerbation of COPD is acute in onset ,which is the worsening of the patient's condition from the stable state characterized by change in the patient's baseline cough ,dyspnoea & sputum production(3). Exacerbation is the amplification of inflammatory response in COPD patients & is triggered by bacterial ,viral infections or by environmental pollutants (8). In severe cases , the patient is unable to maintain the normal blood gases that lead to respiratory failure(9) .

Typically 26% of the exacerbations are caused by bacteria , 25% by viruses , 27% by combination of two & 22% with no ascertainable cause (10) . Therefore , the predominant cause of acute exacerbations in COPD are bacterial infections (10). In healthy individuals , the lower airways are sterile ,but in COPD patients ,there is bacterial colonization of the lower airways with Hemophilus influenza , Streptococcus pneumonia & Branhamella catarrhalis (11,12) . The most common risk factor for colonization in COPD is cigarette smoking ~85%(13) .

Vicious Circle Hypothesis (Pic1) :



Pic : 1

Vicious Circle Hypothesis states that once bacterial pathogens have entered the lower respiratory tract from impaired mucociliary clearance due to tobacco smoking, they persist by further mucociliary clearance. This is due to increased mucous secretion, disruption of normal ciliary activity and airway epithelial injury (14,15)

Frequent exacerbations are associated with an accelerated decline of lung function, reduced physical activity, poorer quality of life & an increased risk of mortality(16,17). Patients with frequent exacerbations have higher levels of IL-6 & IL-8 in sputum with infrequent exacerbations, suggesting the higher incidence of bacterial colonisation(18). The presence of bacteria depends on the severity of airway disease(18). Bacterial pathogens alter the host response to cigarette smoke, induce the inflammatory change & hypersensitivity that enhances airway hypersensitivity(19).

Bacterial infection complicating COPD is diagnosed by the microbiological data(20). Neutrophils in sputum gram stain indicates the bacteria inducing an inflammatory response rather than colonization(21).

Sputum cultures do not always correlate with clinical parameters & gram stain results (21,22). Antibiotics is the vital therapy for patients with severe exacerbations(23). The choice of antibiotics depends on the sputum culture & sensitivity test. Mild to moderate exacerbations have a high spontaneous remission rate(23).

For diagnosing & grading the acute exacerbation of COPD, clinical guidelines WINNIPEG CRITERIA (24) used based on *Increased Breathlessness, Sputum Volume & Purulence*.

THE WINNIPEG CRITERIA :

- TYPE 1- all the 3 symptoms
- TYPE 2-any 2 symptoms
- TYPE 3-any 1 symptom plus at least 1 of the following ; URTI lasting > 5 days, fever, increase in wheeze, increase in cough and increase in heart rate 20 %.

Objective of the Study

Objective of the study is to identify the most common bacterial organism isolated from sputum of COPD patients from Out Patient Department.

II. Material & Methods

Study Population:

Patients who were >40 years old, attended Medical OPD at Madha Medical College & Research Institute, diagnosed with COPD(25) and having symptoms of acute exacerbation were screened for participation. The study was conducted between October 2017-May 2018.

The Spanish Society of Pneumology and Thoracic Surgery 1996 definition was used to diagnose COPD(25), whereas the presence of at least two of the three following symptoms defined by Anthonisen et al(26) was required to diagnose exacerbations: (1)increase in dyspnoea ;(2)increase in the production of sputum ;and (3)increase in purulence of sputum.

Inclusion criteria:

- COPD patients diagnosed according to Spanish Society of Pneumology and Thoracic Surgery 1996 definition was used to diagnose COPD(25).
- Acute exacerbation based on increased dyspnoea, increased sputum volume and purulence.
- Patients requiring inpatient ward admission.
- Adequate sputum sample based on <10 squamous epithelial cells and > 25 pus cells.

Exclusion criteria:

- 1. Patients having bronchiectasis, tuberculosis, asthma, malignancy, community acquired pneumonia.
- 2. Previous admission or antibiotic treatment in the last 21 days.
- 3. Patients managed in outpatient department, emergency or admission required in Intensive Care Unit.
- 4. Ischaemic heart disease patients.

Microbiological sputum study:

All the patient's sputum samples were obtained at the first visit to OPD or emergency department in Madha Medical College & Research Institute. Samples were collected in sterile vial & sent within 2 hours to the central laboratory. Sputum sample to be deemed acceptable for analysis; Microbiological study done by using a low magnification lens (x100) reveals <10 epithelial cells & > 25 leucocytes per field.

Selected sputa were processed microbiologically for quantitative study following accepted laboratory method. Using the microbiological loop, 0.01 ml sputa were seeded in the following culture media: blood agar, MacConkey agar, Chocolate agar, Sabouraud's agar plus chloramphenicol. Incubation was carried out at 35 +/- 2°C in aerobic condition. In case of chocolate agar, the atmosphere contained 5-7% carbon dioxide. A first reading was taken after 24 hours, second final one was taken after 48 hours of culture(27).

The sensitivity of bacteria identified as potentially pathogenic microorganisms to antimicrobial agents was studied by the minimum inhibitory concentration technique. Classifications as sensitive, intermediate & resistant were made according to the criteria issued by the national committee for clinical laboratory study(28). Antibiotics tested were the following: amoxicillin, amoxicillin/clavulanic acid, co-trimoxazole, cefixime, cefuroxime, erythromycin and ciprofloxacin.

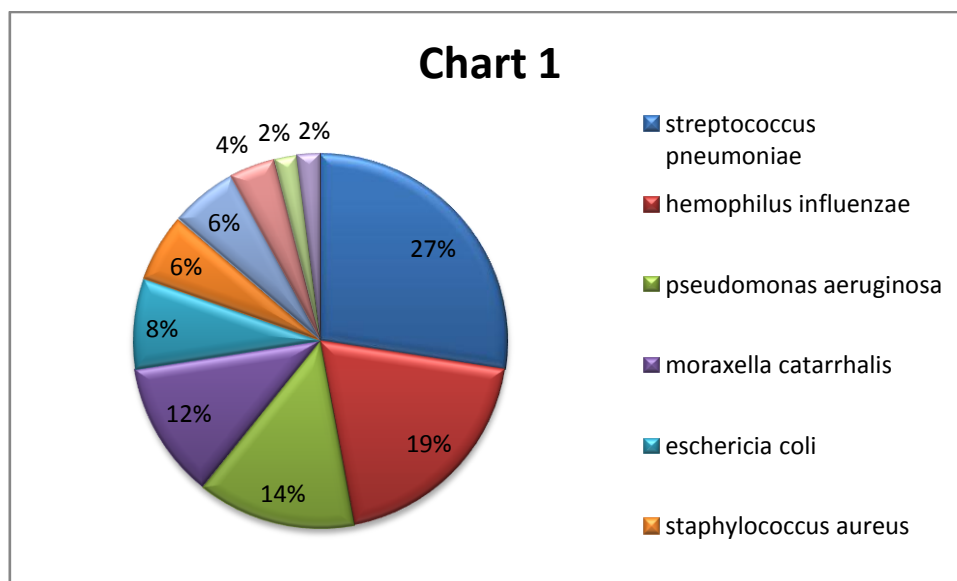
III. Result

Total of 70 patients, fulfilling the inclusion & exclusion criteria, 40 male & 30 female with 57% & 43%. Out of 70 patients, 19 showed the overgrowth of the normal commensal in sputum, so only 51 patients(72%) showed growth with culture positive. In terms of age, the study group belongs to a wide range from 40 years to > 80 years with maximum patients (35%) belonging to the age group of 50-60 years followed by 60-70 years (25%) and 40-50 years (21.88%),

Table 1

S.No	Organism Name	Number	Percent
1	Streptococcus pneumonia	14	27
2	Hemophilus influenza	10	20
3	Pseudomonas aeruginosa	7	14
4	Moraxella catarrhalis	6	12
5	Escherichia coli	4	8
6	Staphylococcus aureus	3	6
7	Citrobacter freundii	3	6
8	Klebsiella pneumoniae	2	4

9	Acinetobacter baumannii	1	2
10	Proteus mirabilis	1	2



The following organisms were isolated in significant concentration in sputum as noted in (Table 1) (Chart 1) : Streptococcus pneumonia (14 cases,27%) , Hemophilus influenza(10 cases,20%) , Pseudomonas aeruginosa(7 cases , 14%) , Moraxella catarrhalis (6 cases , 12%) , Escherichia coli(4 cases,8%) , Staphylococcus aureus (3 cases , 6%) , Citrobacter freundii (3 cases,6%) , Klebsiella pneumonia (2 cases,4%) , Acinetobacter baumannii (1 case,2%) , Proteus mirabilis (1 case , 2 %).

The usual organisms which used to be considered responsible for AECOPD like S. Pneumonia , H.influenza were sensitive to commonly used antibiotics like cephalosporins , aminoglycosides , fluoroquinolones .Gram Negative Bacteria were sensitive to colistin & polymyxin compared to above antibiotics. Organism like E.coli were mostly resistant to second and third generation cephalosporins .

IV. Discussion

COPD considered as leading cause of mortality & morbidity & exacerbation of COPD brings burden to both patient & hospital .The common trigger for acute exacerbation of COPD are infections due to virus or bacteria of the trachea-bronchial tree & air pollution (29) . Our study has maximum number of cases in 50-60 years age group which correlate with the study in American lung association (30).our study showed sputum culture positive in 72 % who presented with AECOPD & around 50% of exacerbation of COPD had lower respiratory tract isolated organisms .similar bacterial isolation were found in many Indian based Studies (31,32,33). Strep.pneumoniae is the most common organism isolated in our study which correlates to Sanjay Sethi(34) & Patel AK(35) who had similar results in 2015.Several studies(33,36) found Pseudomonas aeruginosa most common organism to be responsible for AECOPD .Individuals with severe pulmonary function impairment , manifested by FEV1 <50% predicted , are at sixfold higher risk of suffering acute exacerbation caused by H.influenza or Pseudomonas aeruginosa (37) .

V. Conclusion

AECOPD had serious negative impact on patient pulmonary function , quality of life as well as socioeconomic status. COPD can be triggered or exaggerated commonly by bacterial and viral infections with variable profile depending on the geographical areas. . COPD has many aetiology , smoking and environmental pollution plays the major role in it. AECOPD can be triggered by bacterial infection since many patients had infection in lower airway or it can be non infectious can be triggered by allergens which needs to be conformed by laboratory investigation.

So it is important to do a routine sputum culture sensitivity for all the COPD patient who attend the routine outpatient department in regular intervals and mandatory for In-Patients to prevent bacterial infections caused by airway infection. It also helps in choosing appropriate antibiotics and prevent antibiotic resistance. All together it reduces morbidity and mortality due to COPD.

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