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Identification of infectious etiological agents in acute exacerbation of COPD

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ABSTRACT

Introduction-Chronic obstructive pulmonary disease (COPD) is a common respiratory condition involving the airways and characterized by airflow limitation.

According to the Global Burden of Disease Study 2010, COPD is the fourth leading cause of death in the world and is projected to be third leading cause by 2020. The chronic course of this disease is frequently accompanied by acute exacerbations, usuallydue to infections.

Materials and methods- A total of 50 patients were included in the study.**T**he data was collected using structured proforma including demographic data, clinical history and lab investigations. Descriptive statistical analysis (such as mean, median, standard deviation and percentage) has been carried out in the present study.

Results-In the present study of 50 study subjects comprised of 46 males and 4 females with mean age of 70.5 years. In 38% of the patients, bacteria were determined to be the cause of AECOPD. [Klebsiella pneumoniae (52.63%), Escherichia coli (31.57%) and Streptococcus pneumoniae (15.78%)]. Among viral etiology, parainfluenza(44.4%), influenza(27.8%) and Respiratory syncytial virus(22.2%). Among Atypical organisms Mycoplasma, Chlamydiae and Legionella accounted for 38.46%, 30.77% and 30.77% of the cases, respectively.

Conclusion-

Present study indicates that gram-negative bacteria play a major role in exacerbation of COPD in our population .Among bacterial infections, Klebsiella was most common organism.

Para influenza followed by influenza and RSV are common viral etiological agents in exacerbations.

Present study indicates that a good proportion of COPD exacerbations were caused by atypical bacteria. Mycoplasma was the most commonly isolated organism followed by Chlamydia pneumophila and Legionella species.

Keywords: COPD, infectious etiological agents, children

Introduction

Chronic Obstructive Pulmonary Disease is a preventable and treatable disease with some significant extra pulmonary effects that may contribute to the severity in individual patients. Its pulmonary component is characterized by airflow limitation that is not fully reversible. The airflow limitation is usually progressive and associated with an abnormal inflammatory response of the lung to noxious particles or gases[1].

Chronic obstructive pulmonary disease (COPD) is a common respiratory condition involving the airways and characterized by airflow limitation.

According to the Global Burden of Disease Study 2010, COPD is the fourth leading cause of death in the world and is projected to be third leading cause by 2020.The chronic course of

this disease is frequently accompanied by acute exacerbations, characterised by an acute sustained worsening of the patient's condition from a stable state beyond normal day-to-day variations, which may warrant additional treatment[2].

Infections (viral and bacterial) may contribute to the pathogenesis and progression of COPD, and the bacterial colonization associated with airway inflammation and may also play a significant role in exacerbations[3].

A history of severe childhood respiratory infection has been associated with reduced lung function and increased respiratory symptoms in adulthood. There are several possible explanations for this association (which are not mutually exclusive).There may be anincreased diagnosis of severe infections in children who have underlying airway hyperresponsiveness, itself considered a risk factor for COPD[4].

Susceptibility to viral infections may be related to another factor, such as birth weight, that is related to COPD.

HIV infection has been shown to accelerate the onset of smoking-related emphysema; HIV-inducedpulmonary inflammation may play a role in this process.

COPD exacerbations further effectthe FEV1 and strongly influence health-related quality of life.Hence each exacerbation should be managed properly. Infections contribute80%of exacerbations. Recent studies shows there is change in the spectrum of micro organisms causing exacerbation[5, 6].

Methodology

Inclusion criteria

All hospitalized patients with Acute Exacerbation of COPD fitting into GOLD criteria.

Exclusion criteria

Patients with recent hospital admission for any other reasons, within past 3 months.

Patients with other causes of acute exacerbation of COPD like recent myocardial infarction,cardiac failure, pneumothorax, pulmonary embolism, etc.

Duration of study

50 patients over a duration of 2 years.

Type of study

Prospective type of study.

Method of study

After approval from scientific research committee and Institutional ethics committee study was started.

Demographic data and management in hospital:-Detailed information on the COPD exacerbations including demographic data (age, sex, height and weight, background illness and functional status), symptoms, blood test results and length of hospital stay was be recorded.

In addition Chest radiographs will be assessed for any abnormalities like pneumonic changes will be noted.The type and duration of antibiotics used will be recorded. Any non-invasive ventilation used or intensive care unit admissions will be assessed.

Sputum for Gram stain,Sputum culture & sensitivity and IgG antibodies against viruses and atypical organisms will be sent.

Sputum culture and sensitivity was done collecting sputum in sterile containers and were incubated on sheep blood agar, chocolate agar and MacConkey agar.

IgG antibodies against viruses and atypical organisms is done by indirect immuneofluorescentassay (IFA) kit.Sensitivityis 94.6% to 100%and specificity is 90% to 100%based on micro-organism.

Results

Table 1: Distribution according group of organism

Serology	Count	Percent
Virus	18	36.0
Atypical Organism	13	26.0
Bacteria	19	38.0

Bacteria(38%) and virus(36%) are of same percentage of isolation whereas as compared to Atypical organisms(26%) were little less.

Table 2: Distribution according to sputum culture & serology

Sputum Culture	Count	Percent
Pneumococcus	3	6.0
Klebsiella	10	20.0
Escherichia Coli	6	12.0
Influenza	5	10.0
Parainfluenza	8	16.0
Respiratory syncytial virus	4	8.0
Adenovirus	1	2.0
Mycoplasma	5	10
Chlamydia	4	8
Legionella	4	8

Table 3: Distribution among bacteria

Bacteria	Count	Percent
Pneumococcus	3	15.79
Klebsiella	10	52.63
Escherichia coli	6	31.58

Among bacteria Klebsiella was most common isolated pathogen.Parainfluenza was most commonly isolated among viruses as etiological agent.

Table 4: Distribution among Viruses

Virus	Count	Percent
Influenza	5	27.8
Parainfluenza	8	44.4
RSV	4	22.2
Adenovirus	1	5.6

Parainfluenza was most commonly isolated organism among viruses as an etiological agent followed by influenza and RSV.

Table 5: Distribution among atypical organism

Atypical organism	Count	Percent
Mycoplasma pneumoniae	5	38.46
Chlamydia Pneumophila	4	30.77
Legionella species	4	30.77

Among atypical organisms Mycoplasma was most commonly isolated pathogen.

Table 6: Distribution according to ventilation

Ventilation	Count	Percent
Mechanical Ventilation + NIV	3	6.0
N I V	14	28.0
Not Used	33	66.0

Only 3 patients required Mechanical ventilation and most of them are managed with supportive measures.

Discussion

In the present study of 50 study subjects comprised of46 males and4 females with mean age of 70.5 years.

38% of the patient'sbacteria were isolated as a cause of exacerbation of COPD. In the present study Gram negative bacilli were more isolated than Gram positive cocci. The commonest isolate was Klebsiella pneumoniae 10(52.63%), followed by Escherichia coli 6(31.57%) andStreptococcus pneumoniae 3(15.78%).

In previous studies in the western countries, the predominant organisms during acute infective exacerbations were believed to be Streptococcus pneumoniae, nontypeableHaemophilus influenzae, and to some extent Moraxella catarrhalis[7, 8].

We attribute that this major aetiologicaldifferance is due to different study population of hospitalised patients alone.More overmost of thease patients had previous exacerbations in community which was treated with various antibiotics

Similar results are also seen in an Indian study by Chawla *et al.*,*P.aeruginosa* was the predominant isolate (25.92%) amongst the hospitalized patients followed by *S.pneumoniae* and *Acinetobacter* spp. (18.51% each), *Klebsiella* spp. and *M.catarrhalis* (14.80% each)[9].

Escherichia coli was also found as pathogenic organism in many studies, especially hospitalised patients.

Pseudomonas infection is usually seen inpatients with recent hospitalisations and history of antibiotic exposure. In some studies, Pseudomonas is common pathogen isolated in exacerbations.But in present study patients with previous hospitalisation within last 3 months were not included, which may be the cause of non-identification of Pseudomonas in present study.

Virus as acause of exacerbation of COPD in many studies. In our study para influenza(44.4%) was most common pathogen, followed by a influenza(27.8%)and Respiratory syncytial virus.

Patrick Mallia*et al.*, -Influenza remains a pathogen associated with considerable morbidity & mortality especially in high risk group such as patients with COPD.

RSV was also found as etiological agentin many studies.

Fasley*et al.*, reported that 11.4% of hospital admissions for COPD could be accounted by the presence of RSV[10].

Atypical organisms were considered as rare cause of exacerbation of COPD. But its isolation in acute exacerbations increasing as evidenced in recent studies. Present study there was 26% isolation of atypical organism as etiological agent. Among them Mycoplasma, chlamydiae and legionella were 38.46%, 30.77% and 30.77% respectively.

One recent study suggested that up to14% of exacerbations were associated with mycoplasma.

Meloni*et al.*,described serological and molecular evidence of current *Chlamydia pneumoniae* infection in 8.9% of patients during exacerbations of COPD, while Beaty*et al.*,found evidence of acute infection in 5% of exacerbations[11].

Legionella was thought very rare. Lieberman *et al.*present data on a large population, hospitalized with acute exacerbations of COPD, which provides evidence for the first time for *Legionella* spp. infection as a potential underlying pathogen in as many as 16.7% of cases[12].

Conclusion

Present study indicates that gram-negative bacteriaplays a major role in exacerbation of COPD in our population.Among bacterialisolations klebsiella was most common organism.
Para influenza followed by influenza and RSV are common viral etiological agents in exacerbations.
Present study indicates that a good proportion of COPD exacerbation was caused by atypical bacteria. Among atypical bacterial Mycoplasma was more commonly isolated followed by *Chlamydia pneumoniae*and legionella species.

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