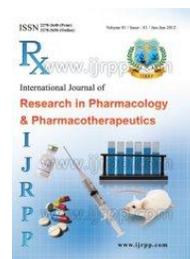




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Study the pattern of use of antimicrobials in community acquired pneumonia

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ABSTRACT

Background: Pneumonia is a common illness having significant morbidity and mortality. Irrational use of antibiotics in the treatment of pneumonia has led to antibiotic resistance, over prescribing and increased cost of treatment. Therefore, the present study was undertaken to evaluate the trends of antimicrobial prescription in community acquired pneumonia.

Aim: The present study was undertaken with the aim of studying the pattern of use of antimicrobials in community acquired pneumonia.

Materials and Methods: All the antimicrobial containing prescriptions of community acquired pneumonia were monitored. Data from the 80 prescriptions was entered into data entry forms. The number of antimicrobials per prescription, various groups of antibiotics and combinations of antibiotics used for the treatment of community acquired pneumonia, route of administration of antibiotics, duration of antibiotic therapy and length of hospital stay in in-patients was analysed.

Results: In the present study it was observed that community acquired pneumonia was most common in the age group of 42-60 years and the disease was more prevalent in males as compared to females. In the present study 58.75% were in-patients and 41.25% were out-patients. Study showed that 83.75% of the patients received the treatment for 7 days and 16.25% of the patients received the treatment for 14 days. For administration of antibiotics oral route was used in 42.5% of patients and intravenous route was used in 57.5% of patients. Azithromycin was most commonly used antibiotic and combination therapy was given in all the patients and none of the patient was treated with single antibiotic. In the present study most commonly used combination was amoxicillin-azithromycin given in 34 patients. Three antibiotics were given in about 47.5% of patients and two antibiotics were given in 52.5% of patients.

Keywords: Community acquired pneumonia, antimicrobials, overprescribing, antibiotic resistance

INTRODUCTION

Community acquired pneumonia (CAP) is pneumonia that has been acquired in a community in

a patient who has not been hospitalized within 14 days prior to onset of symptoms or hospitalized less than 4 days prior to onset of symptoms.^[1] The

mortality rate is less than 1% for persons with CAP who do not require hospitalization; however, the mortality rate averages from 12% to 14% among hospitalized patients with CAP. Among patients who are admitted to the intensive care unit (ICU), or who are bacteraemic, or who are admitted from a nursing home, the mortality rate averages from 30% to 40%. Therefore, it is crucial that physicians recognize and treat CAP appropriately.^[2]

Constant exposure to contaminated air and frequent aspiration of nasopharyngeal flora make lung parenchyma susceptible to virulent micro-organisms. Most microorganisms reach lower respiratory tract as inhaled and contaminated micro-droplets. Complex interactions between virulence and quantum of aspirated or inhaled microorganisms, that arrive at lower respiratory tract, integrity of defense barriers and host immunity status, decide occurrence of pneumonia.^[3,4] The extensive list of potential etiologic agents in CAP includes bacteria, fungi, viruses and protozoa. Newly identified pathogens include hanta viruses, metapneumo viruses, the coronavirus responsible for severe acute respiratory syndrome (SARS) and community-acquired strains of methicillin-resistant *Staphylococcus aureus* (MRSA). Most cases of CAP, however, are caused by relatively few pathogens. Although *Streptococcus pneumoniae* is most common, other organisms must also be considered in light of the patient's risk factors and severity of illness.^[5]

The American Thoracic Society (ATS) emphasizes certain modifying factors that increase the risk of infection with drug-resistant and unusual pathogens. Risk factors for drug-resistant *Streptococcus pneumoniae* (DRSP) include age greater than 65 years, beta-lactam therapy within the past 3 months, immunosuppression (either as the result of an illness or induced by treatment with corticosteroids), multiple medical comorbidities, alcoholism and exposure to a child in a day care center. Risk factors for enteric gram-negative organisms are as follows: recent antibiotic therapy, underlying cardiopulmonary disease, residence in a nursing home and multiple medical comorbidities.^[6] CAP can vary from indolent to fulminant in presentation and from mild to fatal in severity. The various signs and symptoms that depend on the progression and severity of the infection include both constitutional

findings and manifestations limited to the lung and associated structures. The patient is frequently febrile with tachycardia or may have a history of chills and/or sweats. Cough may be either non-productive or productive of mucoid, purulent or blood-tinged sputum. Depending on severity, the patient may be able to speak in full sentences or may be very short of breath. If the pleura is involved, the patient may experience pleuritic chest pain.^[5]

The presentation of pneumonia can vary from a mild, self-limiting illness to a severe, life threatening illness with significant mortality. Thus the most important decision facing the physician once a diagnosis of pneumonia is confirmed is the site of care. This decision affects both patient outcomes and healthcare costs.^[7,8] Several predictive models and scoring systems have been developed and validated to help develop uniform, guidelines based protocols.^[9] CURB 65 is a simpler scoring system which is easier to remember and apply.^[10]

CURB65 uses five variables which include confusion, urea more than 20mg/dl, respiratory rate more than 30/min, blood pressure (systolic blood pressure less than 90 mm/hg or diastolic blood pressure less than 60 mm/hg) and age more than 65 years. Each parameter is assigned one point to get a severity score. The recommendations on the basis of CURB65 scoring are outpatient treatment for patients with a score of 0-1, hospital admission for a score of 2 and consideration for admission to ICU with a score of 3 or more. CRB 65 can be used when urea levels are not available. CRB65 has the benefit of using only clinical parameters and has been found to have discriminatory value similar to CURB65.^[11]

The first step in treatment of CAP following severity assessment and decision regarding site of care, is initiation of treatment with appropriate antibiotics as bacteria are the most common pathogen. Early initiation of antibiotics is seen to abbreviate the illness and lead to a decrease in both complications and mortality. This is usually empirical as the organism is not isolated in a large proportion of patients at the onset.^[9]

Severe cases of CAP require immediate institution of therapy, which must be adjusted after confirming microbiological etiology. Switch from intravenous antibiotics to oral treatment is recommended in case of observed improvement in symptoms, improved

respiratory rate and oxygen saturations, patient being afebrile for >24 hours, hemodynamic stability, reduction in white blood cell count (if elevated earlier) and absence of nausea/ vomiting.^[9]

All appropriate spectrum antibiotics are equally effective. The main purpose is to target streptococcus pneumonia. Beta-lactams and macrolides are most commonly used antibiotics. Combination therapy is recommended for severe pneumonia only.^[12] Pneumonia is a common illness having significant morbidity and mortality. Irrational use of antibiotics in the treatment of pneumonia has led to antibiotic resistance, over prescribing and increased cost of treatment. Therefore, the present study was undertaken to evaluate the trends of antimicrobial prescription in community acquired pneumonia.

MATERIALS AND METHODS

Study Design

This prospective, open and observational study was conducted for the duration of one year starting from the date of approval of protocol of study and the approximate sample size calculated for the study was 80. The patients of community acquired pneumonia attending the department of Chest and Tuberculosis, Rajindra Hospital, Patiala were included. The patients fulfilling the inclusion criteria and having none of the exclusion criteria were enrolled in the study after obtaining written informed consent.

Inclusion Criteria

All patients with radiological or clinical evidence of community acquired pneumonia.

Exclusion Criteria

1. Patients <18 years of age
2. Immunosuppressed (HIV positive or concurrent chemotherapy or immunosuppressant therapy)
3. Cystic fibrosis
4. Bronchiectasis
5. Suspected or confirmed tuberculosis
6. Aspiration or hospital-acquired Pneumonia

7. Discharged from hospital within the previous 14 days
8. Transferred from another hospital (unless transferred within 4 hours of presentation at original institution)
9. Patients unwilling or unable to comply with study proceedings

Study Sequence

All the patients were informed about the study in layman language and written informed consent was taken. The patients of community acquired pneumonia coming to the department of Chest and Tuberculosis, Rajindra Hospital, Patiala were included in the study. All the antimicrobial containing prescriptions of community acquired pneumonia were monitored. Data from the prescriptions was entered into data entry forms. The number of antimicrobials per prescription, various groups of antibiotics and combinations of antibiotics used for the treatment of community acquired pneumonia, route of administration of antibiotics, duration of antibiotic therapy and length of hospital stay in in-patients was analysed.

Statistical Analysis

Descriptive statistics had been applied for the analysis of data. Data was expressed in proportion and percentage form and represented in the form of tables, charts and bar diagrams.

RESULTS

Data from 80 prescriptions was entered into data entry forms. Patients of either sex, both in-patients and out-patients were included in the study. The prescriptions were analysed for the number of antimicrobials per prescription, various groups of antibiotics and combinations of antibiotics used for the treatment of community acquired pneumonia, route of administration of antibiotics, duration of antibiotic therapy and length of hospital stay in in-patients.

TABLE-1DISTRIBUTION OF PATIENTS ACCORDING TO AGE

Age group in years	No. of Patients	% Age
18-30	1	1.25
30-42	9	11.25
42-60	50	62.5
60-72	20	25

As shown in the table, the incidence of the disease was more in the age-group of 42-60 years followed by 60-72 years, 30-42 years and 18-30 years as 50 patients out of 80 patients were in the age group of 42-60 years.

TABLE-2DISTRIBUTION OF PATIENTS ACCORDING TO SEX

Sex	No. of Patients	%age
Male	49	61.25
Female	31	38.75

As shown in the table, 49 patients out of 80 patients of community acquired pneumonia were males and 31 patients were females.

TABLE-3DISTRIBUTION OF PATIENTS ACCORDING TO CO-MORBIDITIES

Co-morbidities	No. of Patients	%age
Present	27	33.75
Absent	53	66.25

As shown in the table,co-morbidities were present in 27 patients out of 80 patients of community acquired pneumonia and in 53 patients there were no associated co-morbidities.

TABLE-4DISTRIBUTION OF PATIENTS ACCORDING TO TYPE OFCO-MORBIDITY

Co-morbidity	No. of Patients	%age
CHD	11	13.75
COPD	9	11.25
DM	7	8.75

As shown in the table, CHD was present in 11 patients, COPD in 9 patients and DM in 7 patients therefore the two most common co-morbid illnesses were CHD present in 13.75% of patients and COPD present in 11.25% of patients.

TABLE-5 DISTRIBUTION OF PATIENTS ACCORDING TO SITE OF ADMISSION

Site of admission	No. of Patients	%age
Outdoor	33	41.25
Indoor	47	58.75

As shown in the table, 33 patients were treated in outdoor and 47 patients in indoor.

TABLE-6 DISTRIBUTION OF PATIENTS ACCORDING TO DURATION OF TREATMENT

Duration of treatment	No. of Patients	%age
7 days	67	83.75
14 days	13	16.25

This table shows that 67 patients were treated for 7 days and 33 patients out of the 67 patients who were treated for 7 days were all out-patients and remaining

34 patients were in-patients. 13 patients who were given antibiotics for 14 days were all in-patients.

TABLE-7 DISTRIBUTION OF PATIENTS ACCORDING TO INVESTIGATIONS DONE FOR DIAGNOSIS

Investigations	No. of Patients	%age
X-ray	80	100
Blood culture	47	58.75
Sputum culture	49	61.25
Gram stain	49	61.25

As shown in the table, X-ray was done in all the 80 patients, blood culture was done in 47 patients

whereas sputum culture and gram stain was done in 49 patients.

TABLE-8 DISTRIBUTION OF PATIENTS ACCORDING TO CRITERIA FOR RISK STRATIFICATION

CRITERIA	No. of Patients	%age
Clinical Judgment	80	100
CRB-65 Score	0	0

This table shows that in the present study risk stratification was done according to clinical judgement in all the 80 patients and CRB-65 score

for the assessment of severity and site of care was not used in any of the patients.

TABLE-9 DISTRIBUTION OF PATIENTS ACCORDING TO ROUTE OF ADMINISTRATION OF ANTIBIOTICS

Route of administration	No. of Patients	%age
Oral	34	42.5
Intravenous	46	57.5

As shown in the table, antibiotics were given by oral route in 34 patients (out of which 33 patients were out-patients and 1 was in-patient). 46 patients who

were given antibiotics by intravenous route were all in-patients.

TABLE-10 DISTRIBUTION OF PATIENTS ACCORDING TO ANTIBIOTICS USED FOR TREATMENT

Antibiotics	No. of Patients	%age
Amoxicillin	34	42.5
Azithromycin	60	75
Co-amoxiclav	18	22.5
Ceftriaxone	23	28.75
Piperacillin-Tazobactam	20	25
Cefotaxime	5	6.25

As shown in the table, azithromycin was most commonly used antibiotic given in 60 patients. The second most commonly prescribed antibiotic was amoxicillin given in 34 patients followed by

ceftriaxone in 23 patients, piperacillin-tazobactam in 20 patients, co-amoxiclav in 18 patients and least prescribed was cefotaxime given in 5 patients.

TABLE-11 DISTRIBUTION OF PATIENTS ACCORDING TOTYPE OF THERAPY

Type of therapy	No. of Patients	%age
Monotherapy	0	0
Combination therapy	80	100

This table shows that all the 80 patients were treated with combination therapy and no patient was treated with single antibiotic even if the patient was treated

in outdoor and was not having associated co-morbidity.

TABLE-12 DISTRIBUTION OF PATIENTS ACCORDING TO DIFFERENT COMBINATIONS OF ANTIBIOTICS USED FOR TREATMENT

Antibiotic combinations	No. of Patients	%age
Amoxicillin-Azithromycin	34	42.5
Azithromycin-Co-amoxiclav	18	22.5
Azithromycin-Ceftriaxone	3	3.75
Azithromycin-Cefotaxime	5	6.25
Ceftriaxone-Piperacillin-Tazobactam	20	25

As shown in the table, in the present study most commonly used combination was amoxicillin-azithromycin given in 34 patients. The second most commonly prescribed combination was of ceftriaxone-piperacillin -tazobactam given in 20 patients followed by azithromycin-co-amoxiclav given in 18 patients, azithromycin-cefotaxime given in 5 patients and least prescribed was azithromycin-ceftriaxone given in 3 patients.

DISCUSSION

Pneumonia refers to a syndrome caused by acute infection, usually bacteria, characterized by clinical and/or radiographic signs of consolidation of a part or parts of one or both lungs. True incidence of community acquired pneumonia (CAP) is exactly not known.^[13] Diagnosis of CAP is a challenge to the evaluating physician as this condition closely mimics the common cold or flu. Appropriate medical history and physical examination are an important part of making pneumonia diagnosis.^[14,15]The present prospective, open and observational was conducted for the duration of one year to study the trend of use of antimicrobials in community acquired pneumonia.80 prescriptions were analysed and data

from the prescriptions was entered into data entry forms. The mean age of cases was 53.83 years and 61.25% of the patients were males (i.e. 49 patients out of 80 patients) and 38.75% were females (i.e. 31 patients out of 80 patients).Associated co-morbidities were present in 33.75% of patients (i.e. 27 patients out of 80 patients). Out of 27 patients with co-morbidities 14 patients were out-patients and 13 were in-patients. The two commonest co-morbid illnesses were chronic heart disease (CHD) present in 11 patients out of 27 patients with co-morbidities and chronic obstructive pulmonary disease (COPD) present in 9 patients out of 27 patients. In the present study incidence of the disease was more in the age-group of 42-60 years followed by 60-72 years, 30-42 years and 18-30 years. In the Finnish study the annual incidence in the age group of 16-60 years was 6 per 1000 population and 34 per 1000 population for those aged 75 years and above.^[97] A similar pattern was reported from Seattle, USA.^[16]Increasing age was associated with an increasing incidence of admission to hospital with community acquired pneumonia in Canada; from 1.29 per 1000 persons aged 18-39 years, to 1.91 per 1000 persons aged 40-54 years, to 13.21 per 1000 persons aged 55 years or

above.^[17]In the present study risk stratification was done according to clinical judgment in all the 80 patients and CRB-65 score for the assessment of severity and site of care was not used in any of the patients but according to Guidelines for Diagnosis and Management of Community Acquired Pneumonia in Adults: Joint ICS/NCCP Recommendations (ICS/NCCP Guidelines) both clinical judgment and CRB-65 score are recommended for initial assessment and risk stratification of the patients of community acquired pneumonia. In the present study x-ray was done in all 80 patients whether out-patients or in-patients and blood culture, sputum culture and gram stain was done in all the 47 in-patients. In the present study 67 patients received antibiotic therapy for 7-days which included all the out-patients (33 patients) and 34 in-patients out of 47 in-patients whereas 13 patients who were all in-patients received antibiotic therapy for 14-days. In the present study out-patients were treated with combination therapy (beta-lactam plus macrolide) irrespective of presence or absence of co-morbidities and none of the patient without co-morbidity was treated with monotherapy. All the patients were given oral therapy. In in-patient setting 9 patients were treated with two-drug combination therapy (1 patient with amoxicillin-azithromycin, 5 patients with azithromycin-cefotaxime, 3 patients with azithromycin-ceftriaxone) and 38 patients were treated with three drug combination therapy (18 patients with azithromycin-co-amoxiclav, 20 patients with ceftriaxone-piperacillin-tazobactam). 46 patients out of 47 in-patients were given parenteral therapy.

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CONCLUSION

In the present study it was observed that community acquired pneumonia was most common in the age group of 42-60 years and the disease was more prevalent in males as compared to females. In the present study 58.75% were in-patients (i.e.47 patients out of 80 patients) and 41.25% were out-patients (i.e.33 patients out of 80 patients). Study showed that 83.75% of the patients received the treatment for 7 days and 16.25% of the patients received the treatment for 14 days. For administration of antibiotics oral route was used in 42.5% of patients (i.e. 34 patients out of 80 patients) and intravenous route was used in 57.5% of patients (i.e. 46 patients out of 80 patients). Azithromycin was most commonly used antibiotic given in 60 patients. Study showed that combination therapy was given in all the 80 patients and none of the patient was treated with single antibiotic even if the patient was treated in outdoor and was not having associated co-morbidity. In the present study most commonly used combination was amoxicillin-azithromycin given in 34 patients. Three antibiotics were given in about 47.5% of patients (i.e. 38 patients out of 80 patients) and two antibiotics were given in 52.5% of patients (i.e. 42 patients out of 80 patients).

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