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RESEARCH ARTICLE

"Study of Bacteriological and clinical profile in community acquired pneumonia"

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Abstract

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..... Community-acquired pneumonia (CAP) remains a common and serious illness despite the availability of potent new anti-microbial agents and effective vaccines. Two major variables that influence the spectrum of etiologic agent and initial approach to therapy are the severity of initial presentation and presence of either co-existing illness or advanced age. The bacteriological profile of community-acquired pneumonia is different in different countries and changing with time within the same country, probably due to frequent use of antibiotics, changes in environmental pollution, increased awareness of the disease and changes in life expectancy. Community acquired pneumonia (CAP) has an incidence of about 20% to 30% in developing countries compared to an incidence of 3% to 4 % in developed countries. In this study 200 cases of community acquired The cases included were patients aged more than 14 years pneumonia admitted to the Dept. of Medicine, Dr. BRAM Hospital, Raipur fulfilling the specified inclusion criteria. It was found that The incidence varies markedly with age, being much higher in the very young and the elderly. CAP is one of the common infections of the respiratory tract. It occurs in all age groups, but the incidence is more with advancing age and associated risk factors like smoking, COPD and alcoholism. Identification of the specific pathogen in acute bacterial pneumonia is necessary for rational and appropriate antibiotic therapy. Etiological agents cannot be identified in many cases because of prior use of antibiotics, inappropriate sputum production and non-productive cough. Undiagnosed cases of CAP can be diagnosed by applying serological methods if available, so that appropriate treatment can be given to reduce the morbidity and mortality in these patients. Empirical treatment has to be started for all the cases of CAP, till the culture report arrives. The empirical therapy should be based on the presumptive etiologic diagnosis developed from all available epidemiologic, clinical and laboratory data. Once the culture report is available, the treatment should be based on the drug to which the organism is most susceptible.

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INTRODUCTION

Community-acquired pneumonia (CAP) remains a common and serious illness despite the availability of potent new anti-microbial agents and effective vaccines. The mortality rate of pneumonia patients in out-patient settings is low, in the range of one to five per cent, but among patients who require admissions to ICU it approaches 25% (Fang GDet al 1990, Torres et al 1990). Two major variables that influence the spectrum of etiologic agent and

initial approach to therapy are the severity of initial presentation and presence of either co-existing illness or advanced age. The bacteriological profile of community-acquired pneumonia is different in different countries and changing with time within the same country, probably due to frequent use of antibiotics, changes in environmental pollution, increased awareness of the disease and changes in life expectancy. The problem is much greater in the developing countries where pneumonia is the most common cause of hospital attendance in adults(MacfarlaneJ etal 1987). In India also the etiological agent of CAP varies with geographical distribution e.g. Streptococcuspneumoniae predominates as etiological agent of CAP in Shimla(Bansal S et al 2004) and Delhi(Capoor MR et al 2006) whereas Pseudomonasaeruginosa pre-dominates as an etiological agent in blood culture positive CAP in Ludhiana (Oberoi A, Agarwal A 2006). Studies reported during the last two decades have also reported a higher prevalence of Klebsiella pneumoniae among culture positive pneumonias (Madhu SV et al 1990, Madhulatha CK et al 2013). Community acquired pneumonia (CAP) has an incidence of about 20% to 30% in developing countries compared to an incidence of 3% to 4% in developed countries (Karetzky M et al 1993). The incidence varies markedly with age, being much higher in the very young and the elderly. It is estimated that India together with Bangladesh, Indonesia and Nepal account for 40% of global acute respiratory infection; 90% of mortality is due to pneumonia, mostly bacterial in origin. It is hoped that the knowledge of relevant prognostic factors might be useful for early identification of patients at high risk requiring intensive care treatment

MATERIALS & METHODS

place of study :-Dept. of Medicine , Pt.JNM Medical college &

Dr.B.R.Ambedkar Memorial Hospital, Raipur

sample size :-200 cases of community acquired pneumonia.

selection of cases :-

The cases included were patients aged more than 14 years admitted to the Dept. of Medicine, Dr. BRAM Hospital, Raipur fulfilling the specified inclusion criteria.

inclusion criteria:-

Patients with new or progressive pulmonary infiltrates on chest radiograph with at least two of the following four:

- * fever * cough
- * purulent sputum production
- * leucocytosis over 10,000/mm³.

exclusion criteria

- Patients with radiographic evidence of tuberculosis
- AIDS
- Patients on immunosuppressive therapy
- Patients hospitalised within previous 14 days
- Pulmonary infarction
- Patients with an alternate diagnosis during follow-up

METHODOLOGY

- Selection of cases: All patients who were admitted in the dept. of medicine fulfilling the inclusion criteria for the study.
- Informed consent from patients was taken.
- A detailed history regarding presence of fever, cough, purulent sputum production and pleuritic chest pain was noted.
- Blood samples for complete hemogram, renal and liver function tests, electrolytes and random/fasting blood sugar, serum albumin, total protein were sent at the time of admission.
- Chest X-ray P/A view

- ECG
- ABG
- Sputum collection was done for gram staining , AFB staining

and culture / sensitivity

- Blood culture and sensitivity
- Throat swab culture

SAMPLE COLLECTION

Sputum collection for staining & culturewasdone at the time of admission for -

- Gram staining and AFB staining.
- Sputum containing more than 25 polymorph nuclear cells and less than 10 epithelial cells per low power field was subjected to gram staining. (MandellLA,Wunderink R 2012)
- Sputum was also subjected to bacterial culture on blood agar and Mac Conkey's agar media.
- In patients who could not expectorate sputum spontaneously, sputum induction was done by three per cent hypertonic saline nebulisation.

Blood collection for culture

• Two samples for blood culture were drawn from two different sites 30 minutes apart and were inoculated over blood agar and Mac Conkey's Agar media respectively at 37°C for 24-48 hours.

All above mentioned investigations were performed using following equipments -

- 1) I Lab 650 Clinical Chemistry System, fully automated analyzer was used for renal function test, liver function test and random blood sugar examination.
- 2) Gem Premier 3000, fully automated analyzer from I Lab was used for ABG Analysis.
- 3) I-Lyte, Na K Cl System was used for serum electrolyte(Na, K, Cl) Analysis.
- 4) Lablife(RFCL)H3D and Abacus(ARK) automated hematological analysers were used for CBC Analysis.
- 5) **Gibson's pulse oximeter**was used for analysis of oxygen saturation.
- 6) **Blood Urea Nitrogen (BUN) =** Blood Urea/2.14

OBSERVATIONS AND RESULTS

Most number of CAP cases were in the 50-59yrs age group (26%) followed by 60-69 yrs (24%) and 40-49 yrs (17.5%). The least number of patients were in the <20 yrs age group (2.5%).

Mean age of the patients was calculated to be 51.7 ± 14.809 years.

 $(Mean \pm S.D)$

60% of the cases are in \geq 50 years of age.

63.5% of cases are males and 36.5% cases were females.

Male: Female = 1.73:1

Mean age of male patients suffering from CAP =**51.060** ± **14.606** yrs.



Mean age of female patients suffering from CAP =52.808 ± 14.809 yrs.

The most common presenting symptoms in cases of CAP were fever (91.5%) followed by cough (86%) and sputum production (80.5%).

Other presenting symptoms in cases of CAP were Chills (61.5%); Difficulty in breathing (44%) ;Pleuritic chest pain (30.5%) ; Hemoptysis (13.5%) ; Altered sensorium (9.5%) ; Nausea/Vomiting (8%) ; Loose motions (7.5%) & Abdominal pain(6.5%).







Right lower lobe infiltration was most common (49.5%) followed by left lower lobe (22.5%) and multilobar involvement (11.5%).

Themost common predisposing risk factors in cases of CAP were smoking (37%) and alcoholism (14%).

The most common underlying co-morbid conditions observed were COPD (35.5%) followed by dementia (11%); congestive heart failure (6%); seizure disorder(4.5%); diabetes mellitus(4%);Cerebro-vascular disorder(3%); Structural lung disease(2%).



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Derangement of laboratory parameters shows that Leucocytosis >10000/cu mm was seen in 149 cases(74.5%) of CAP ; pH<7.35 pH was seen in 68 cases(34%) of CAP ; HCT<30% was seen in 66 cases(33%) of CAP ; SaO₂<90% was seen in 51 cases(25.5%) of CAP ; Na<130mmol/l was seen in 38 cases(19%) of CAP ; BUN \geq 30 was seen in 30 cases(15%) of





31% cases had no etiological diagnosis while 59% cases had single etiological agent and 10% cases had more than one etiological agent.

60-69 yrs age group has a maximum of 33 cases with diagnosed etiology followed by 50-59 years age group with 32 cases and 40-49 years with 25 cases.

Klebsiella pneumonia (51cases) is the most common etiological isolate followed by Streptococcus pneumonia(21cases) and candida albicans(16 cases).

amongst mixed infections (Klebsiella + candida) is most common with 9 out of 20 cases followed by (Klebsiella +Pseudomonas) with 6 out of 20 cases and (Pseudomonas + Acinetobacter) with 3 out of 20 cases.

only 10 out of 200 cases (5%) were blood culture positive and among those Klebsiella (3 cases;1.5%) was the most commonly isolated organism followed by Pseudomonas, E coli and Streptococcus pneumonia (2 cases;1% each).

only 92 out of 200 cases (46%) were sputum culture positive and among those Klebsiella (39 cases;19.5%) was the most commonly isolated organism followed by Enterococci (18 cases; 9%); Candida albicans (16 cases; 8%); Streptococcus pneumonia (8 cases; 4%) and Acinetobacter(6cases; 3%).



Only 120 out of 200 cases (60%) were throat swab culture positive and among those Klebsiella (41 cases;20.5%) was the most commonly isolated organism followed by Candida albicans (25 cases; 12.5%); Streptococcus pneumoniae(20 cases; 10%); Enterococci (19 cases; 9.5%); Pseudomonas aeruginosa(11 cases; 5.5%); Staphylococcus aureus(4 cases; 2%)

Throat swab culture yielded maximum positive isolation(60%) followed by sputum culture(46%) and blood culture(5%).



Of the 200 patients studied, etiological diagnosis could be established in 138 (69%). Twenty patients had evidence of mixed infections. The most common pathogen was Klebsiella pneumonia (n=66; 33%) followed by Candida spp(n=25; 12.5%); Streptococcus pneumoniae (n=21; 10.5%); Enterococci (n=19; 9.5%) ;Pseudomonas aeruginosa; (n=16; 8%) ; Acinetobacter(n=6; 3%) ;

E coli(n=6; 3%) and Staphylococcus aureus(n=2; 1%).



The single causative etiological agent was isolated from more than one source in 64 cases.

DISCUSSION

Age and sex wise distribution

In our study -

Out of 200 patients, 127 patients (63.5%) were male while 73 patients (36.5%) were female. Male to female ratio was 1.73:1

Most number of CAP cases were in the 50-59yrs age group (n=52; 26%) followed by 60-69 yrs (24%) and 40-49 yrs (17.5%)

In the 50-59 yrs age group there were 33 males and 19 females followed by 60-69 yrs age group which had 29 males and 19 females and 40-49 yrs which had 23 males and 12 females.

Mean age was 51.7 ± 14.809 years (range 18-83 yrs).

Our gender wise distribution was similar to the study by **Oberoi A et al 2006**, where they studied 233 patients of CAP out of which 60.5% were males and 39.5% females.

In the study by **Madhulatha CK S et al 2013**, the mean age of patients was 53.36 ± 17.42 years (range 18-90 years). There were 73 males and 27 females. Male to female ratio was 2.7:1. The maximum number of cases of CAP was in the more than 50 years of age group (60%). which is similar to our study.

In the study by **Shah BA et al 2010** the mean age of patients was 53.36 ± 17.42 years (range 18-90 years). There were 73 males and 27 females. Male to female ratio was 2.7:1. The maximum number of cases of CAP was in the more than 50 years of age group (60%).

In a study of **Yasemin Z et al 2010**, a total of 77 adult patients, 54 male (70.1%), with pneumonia were enrolled in the study. Mean age was calculated to be 54.67 ± 16.99 years (range 20-83). Thirty five (45.5%) patients were older than 60 which was similar to our study.

In a study by **Khattab A et al 2010**, two hundred and ten elderly cases were included in the period of October 2009 to April 2010. The age range of the patients was from 60 to 88 years old with mean age 65.366 years old.61.4% were males and 38.6% were females. This sex distribution was very similar to our study.

In a study by **Moghaddam et al 2013** two hundred patients with community-acquired pneumonia were enrolled (122 males, 78 females). Their mean age was 68 ± 18 years, ranging from 18 to 68 years. The gender wise distribution of cases was very similar to our study.

In the study by **Shah BA et al 2010**,150 cases of community acquired pneumonia were included, 89 (59.3%) were males. The mean age (\pm SD) of males [60.8 (\pm 13.6) years] was higher than that of females [48.3 (\pm 17.0) years].

Irfan M et al 2009 analyzed data on 329 cases, 187 (56.8%) males and 142 (43.2%) females, in the final study group. The mean age of the study group was 62 ± 16.3 years (range: 18 to 92 years).

Assessment of symptoms of pneumonia

In our study the most common presenting symptom in cases of CAP were fever (91.5%) followed by cough (86%) and sputum production (80.5%).

In the study by **Bansal S et al 2004** most common presenting symptoms were fever in 63 (90%), chills in 57 (81%), cough in 68 (97%) and expectoration in 61 (87%) patients. Other symptoms were shortness of breath in 34 (48%), pleuritic chest pain in 24 (34%), hemoptysis in 10 (14%), altered sensorium in six nausea, vomiting and loose motions in five and abdominal pain in four patients which was similar to our study.

In the study by **Shah BA et al 2010** the maximum number of patients presented with fever (95%), cough (99%), tachycardia (92%), pleuritic chest pain(75%) and sputum production(65%), and leucocytosis (43%). Fever was the commonest presenting symptom in our study as well.

In the study by **Irfan M et al 2009**, the common presenting symptoms were fever(77.5%), chills (77%), and cough (72%). Other symptoms were dyspnoea (46%), chest pain (23%) and confusion (14%). Confusion was significantly more common in patients aged 65 years (p<0.05).

In the study by **Madhulatha CK et al** the most common presenting symptoms were cough (99%), sputum production (77%), fever (75%) and other symptoms were difficulty in breathing (45%) and chest pain (37%). **Assessment of signs of pneumonia**

In our study the most common presenting signs in cases of CAP were crepitations (97%) followed by tachycardia (60%) and bronchial breath sounds (46%).

In the study by **Bansal S et al 2004** the most common presenting clinical signs were crepitations in 69 (98%) and bronchial breath sounds in 33 (47%) patients. The other presenting clinical signs included cyanosis in 19 (27%), pleural rub in 18 (26%), tachypnoea in 17(24%), hypotension in nine (13%), pallor in eight(11%), pleural effusion in seven (10%) and jaundice in two (3%), patients which was similar to our study. Twenty-four (34%) patients were already receiving antibiotics at the time of admission.

In the study by **Irfan M et al 2009**, lung crackles (crepitations) were present in 73% and bronchial breathing in 18%. Respiratory examination was normal in 34 (10.3%) patients.

Pattern of lung infiltration

Our study shows that Right lower lobe infiltration was most common (49.5%) followed by left lower lobe (22.5%) and multilobar involvement (11.5%).

In the study by **Bansal S et al 2004** the pattern of lung infiltration was lobar in 56 (80%) and interstitial in 14 (20%) patients. Right lower lobe infiltration was observed most commonly (n=34; 48.6%) followed by left lower lobe (n=15; 21%), multilobar involvement (n=11; 15.7%), right upper lobe (n=6; 8.5%), right middle lobe in two patients and cavitary lesion in one patient. These results were very similar to the results obtained in our study.

In the study by **Irfan M et al 2009** Radiographic features revealed lower zones were affected more frequently than upper zones and bilateral involvement was seen in 24% of cases. Radiographic changes included consolidation (36.2%), patchy infiltrates (48.2%), pleural effusion (23.8%) and atelectasis (7.1%).

Assessment of risk factors of pneumonia

In our study the most common predisposing risk factors in cases of CAP were smoking (37%) and alcoholism(14%). The most common underlying co-morbid conditions observed were COPD (35.5%) followed by dementia (11%) and congestive heart failure (6%).

Smoking was the most important risk factor (43%) in our study. The increased risk of pneumonia in smokers is due to alteration in respiratory flora, mechanical clearance and cellular defenses. Bacterial colonization of lower respiratory tract is more prevalent in smokers than nonsmokers and mucociliary clearance is more defective, owing to a reduction in ciliary beat frequency and changes in volume and viscoelastic properties of respiratory secretions (Abdullah BB et al 2012). Oxidative stress and alterations in responsiveness of inflammatory cells are associated with the physical and chemical properties of tobacco smoke (Marrie TJ et al 2007, Almirall J et al 1999). Tobacco smoking is the most important risk factor for the development of COPD and it is recognized as a risk factor for other

respiratory infections. Recent data suggest that patients who have COPD and CAP are morbid and have a high mortality rate than patients who do not have COPD (**Plouffe JF et al 2008**).Increased incidence and mortality of pneumonia in COPD patients is explained due to defective mucociliary clearance, mucous plugging, airway collapse, respiratory muscle fatigue and the effect of medications used (**Abdullah BB et al 2012**).

In the study conducted by **Bansal S et al 2004** on 70 patients smoking was the most common predisposing risk factor observed in 50(71%) patients with CAP. Co-morbid conditions were noticed in 49(70%) of the patients. Six patients had more than one co-morbid conditions. Chronic obstructive pulmonary disease (COPD) was the most common underlying co-morbid condition observed in 40 cases (57%) and this association was significant (t=9.592; p<0.01).

In the study conducted by **Dharmadhikari V et al 2013** More than half of the study population (52%) was exposed to smoking and 28% was exposed to alcoholism. Addiction was almost exclusively prevalent in male patients. Streptococcus pneumonia (79%) has got strong association with smoking and Klebsiella pneumoniae had a strong relationship with alcoholic patients (65%) COPD was the commonest co-morbidity (23%).Followed by Diabetes Mellitus (19%) and Bronchiectasis (6%).Other co-morbidities included Asthma (2%),

Congestive heart failure (5%), Chronic Kidney disease (2%), Dementia in (2%).

In the study conducted by **Madhulatha CK et al 2013** the most common risk factors identified were smoking (45%) followed by COPD (26%) and diabetes mellitus (8%).

In the study conducted by **Oberoi A et al 2006** the most common risk factor identified was smoking (26.6%) followed by chronic alcoholism (23%), COPD (14%) and diabetes mellitus (13.7%).

In the study conducted by **Shah BA et al 2010** smoking was the most common pre-disposing factor identified in 65% followed by COPD in 57%, Structural lung disease in 21%, DM in 13%, altered consciousness in eight per cent and chronic alcoholism in one per cent.

Assessment of severity of pneumonia by PSI

> Death of CAP patients in each PSI Class

In our study there were 33 deaths (16.5%) out of the 200 patients included. Majority of deaths of CAP patients belonged to PSI risk class V (38.09%;16 out of 42) and IV(20%;16 out of 80).

In a study by **Shah BA et al 2010** which was conducted on 150 patients,16 patients (10.7%) had died. All the patients who died were in PSI class IV or V. Mortality in PSI class I to III was 0%; in class IV, 14.1% and Class V, 34.8 percent.

In a study by **Moghaddam et al 2013** Two hundred patients with community-acquired pneumonia were enrolled (122 males, 78 females). Overall, 36 patients died (18%) during the study period; of those, six had been hospitalized in different wards and the remaining 30 were admitted to ICUs. These results were very similar to our study.

In a study by **Irfan M et al 2009** the overall mortality was 36 (11%), 283 patients were discharged (86%) and 10 (3%) patients were transferred to

another hospital.

CAP is one of the common infections of the respiratory tract, occuring in all age groups, but the incidence is more with advancing age and associated risk factors like smoking, COPD and alcoholism.Identification of the specific pathogen in acute bacterial pneumonia is necessary for rational and appropriate antibiotic therapy.Empirical treatment has to be started for all the cases of CAP, till the culture report arrives. The empirical therapy should be based on the presumptive etiologic diagnosis developed from all available epidemiologic, clinical and laboratory data. Once the culture report is available, the treatment should be based on the drug to which the organism is most susceptible.

Mortality rates progressively increase with increasing risk class in PSI severity scoring system. By using the knowledge of these criteria, patients of CAP can be better prognosticated as regards severity of their illness with consequently better triaging of patients, utilization of resources and appropriate treatment to improve the outcome in this disease.

Conclusion

To conclude, CAP is one of the common infections of the respiratory tract. It occurs in all age groups, but **the incidence is more with advancing age and associated risk factors like smoking, COPD and alcoholism.** Identification of the specific pathogen in acute bacterial pneumonia is necessary for rational and appropriate antibiotic therapy. Etiological agents cannot be identified in many cases because of prior use of antibiotics, inappropriate sputum production and non-productive cough. Undiagnosed cases of CAP can be diagnosed by applying serological methods if available, so that appropriate treatment can be given to reduce the morbidity and mortality in these patients. Empirical treatment has to be started for all the cases of CAP, till the culture report arrives. The empirical therapy should be based on the presumptive etiologic diagnosis developed from all available epidemiologic, clinical and laboratory data. Once the culture report is available, the treatment should be based on the drug to which the organism is most susceptible.

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