Clinical and Bacteriological Profile of Community Acquired Pneumonia in Shimla, Himachal Pradesh

S. Bansal, S. Kashyap¹, L.S. Pal and A. Goel²

Departments of Medicine, Pulmonary Medicine¹ and Microbiology², Indira Gandhi Medical College and Hospital, Shimla, India

ABSTRACT

Background. Community acquired pneumonia (CAP) is a common clinical problem. The present study was designed to evaluate the clinical and bacteriological profile of CAP in Shimla.

Methods. Seventy patients with community acquired pneumonia were enrolled in this study. In all the patients blood culture, sputum culture, pleural fluid culture (if available) and serological studies for the detection of Mycoplasma pneumoniae specific IgM antibodies by enzyme linked immunosorbent assay (ELISA) were done.

Results. Of the 70 patients, 53 (75.6%) had an identifiable atiology with 12 patients having evidence of mixed infection. No organisms could be isolated in 17 patients inspite of using serological methods for Mycoplasma pneumoniae, invasive procedures like bronchoscopic aspirations in addition to the conventional methods like sputum culture, blood culture and pleural fluid culture. The most frequent pathogen was Streptococcus pneumoniae (n = 19; 35.8%) followed by Klebsiella pneumoniae (n=12; 22%), Staphylococcus aureus in (n=9; 17%), Mycoplasma pneumoniae (n=8; 15%), Escherichia Coli (n=6; 11%), β-haemolytic streptococci (n=4; 7.5%) and other Gram-negative bacilli (n=5, 9%).

Conclusion. Age smoking and under lying co-morbid conditions specially chronic obstructive pulmonary disease (COPD) were significantly associated with the development of CAP (p<0.01).

Key words : Community acquired pneumonia, Etiology, Chronic obstructive pulmonary disease, Serological methods, Bacteriology.

INTRODUCTION

Community acquired pneumonia (CAP) remains a common and serious illness with a significant morbidity and mortality despite the availability of potent antibiotics¹. Pneumonia is a microbial infection involving the terminal airways and alveoli of the lung². Pneumonia results in more than 500,000 hospital admissions annually in adults and ranks as the sixth leading cause of death in United States³. The problem is much greater in developing countries where pneumonia is the most common cause of hospital attendance in adults⁴. Though definite
statistics are lacking pneumonia remains a leading cause of death in India\textsuperscript{5}. The cause of CAP is often difficult to establish. The most effective methods are often invasive and cannot always be justified and serological diagnosis is too late to be of any therapeutic use\textsuperscript{6}. Despite the progress made in the diagnosis of pneumonia, it takes a few days to identify the causative microorganism in the blood or sputum samples and the etiology of half of all patients with CAP remains uncertain\textsuperscript{1}. Physicians need reliable data on the relative prevalence of different etiological agents in the patients' area of residence, in addition to the clinical, laboratory and radiological findings in order to initiate antibiotic treatment empirically. The relative frequency of etiological agents varies among different geographical areas\textsuperscript{7}. The clinical profile and etiology of CAP patients in this northwestern Himalayan region of India is not known. The present study was undertaken to determine the clinical profile and etiology of CAP in a prospective manner over a period of one year.

**MATERIAL AND METHODS**

All patients over 15 years of age presenting to the Medicine, Pulmonary Medicine out-patient departments with CAP between March 2000 and February 2001 were included prospectively in the study after due consent. Some of them were admitted to Medical and Chest wards as per the guideline of European Respiratory Society for admission to hospital\textsuperscript{8}. CAP was defined as new or progressive pulmonary infiltrates on chest radiograph together with at least two of the following: fever, cough, production of purulent sputum or leucocytosis \( \geq 10,000 \text{ mm}^3 \). Patients with radiographic or laboratory evidence suggestive of tuberculosis, acquired immunodeficiency syndrome (AIDS), leukaemia and those with chest infiltrates due to other causes such as congestive heart failure, pulmonary infarction or obstructive pneumonia due to lung cancer, and patients receiving immunosuppressive treatment were excluded from the study. In all the patients chest radiograph, complete haemogram, renal and liver function tests, fasting blood sugar and serum electrolyte estimation were done. All efforts were made to obtain sputum at the time of initial clinical evaluation or within 24 hours of admission. In patients who could not expectorate sputum spontaneously, sputum was induced by nebulization with 3% hypertonic saline. Fibreoptic bronchoscopic aspiration was performed where relevant. Sputum originating from lower respiratory tract containing > 25 polymorphonuclear leucocytes and < 10 epithelial cells per low power field (total magnification x 100) was subjected to Gram's staining using Ruhland's modification\textsuperscript{9}.

Sputum was also subjected to bacterial culture on blood agar and MacConkeys agar media. Two blood culture samples were also obtained from each patient at the time of initial visit from different venepuncture sites and were cultured on blood agar and MacConkey's agar media.

Serological evaluation for detection of *Mycoplasma pneumoniae* specific immunoglobulin M (IgM) antibodies was done by enzyme linked immunosorbent assay (ELISA) method in all the patients and in 21 age and sex matched control subjects. Five millilitre of blood was drawn from each patient. Serum was separated under strict aseptic precautions. Samples were stored at \(-20^\circ\text{C}\) for a period not more than six months. All the samples were tested for *Mycoplasma pneumoniae* specific IgM antibodies using a commercially available kit (IBL-HAMBURG, marketed by OSB agencies, India).

**Statistical Analysis**

Significance was evaluated by student 't' test and/or \( \chi^2 \) test and 'p' value less than 0.05 was considered as significant.

**RESULTS**

Of the 77 patients with CAP seen during the study period, seven patients were excluded.
according to various exclusion criteria and the remaining 70 patients were considered for analysis.

Their mean age was of 52.77 ± 18.1 years (range 17-93 years). There were 50 males. Thirty of the 70 patients were in the sixth and seventh decades of life. Patients older than 40 years were more predisposed to the development of CAP ($t=24.441$; $p<0.01$). Smoking was the most common predisposing risk factor observed in 50 (71%) patients with CAP ($\chi^2=12.857$; d.f.$p<0.01$).

Co-morbid conditions were noticed in 49 (70%) of the patients (Table 1). 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 ($t=9.592$; $p<0.01$).

<table>
<thead>
<tr>
<th>S. No.</th>
<th>Co-morbid Condition</th>
<th>No. (%)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>Chronic obstructive pulmonary disease</td>
<td>40 (57)</td>
</tr>
<tr>
<td>2.</td>
<td>Heart diseases</td>
<td>5 (7)</td>
</tr>
<tr>
<td>3.</td>
<td>Diabetes mellitus</td>
<td>3 (4.2)</td>
</tr>
<tr>
<td>4.</td>
<td>Alcoholism and alcoholic liver disease</td>
<td>2 (2.8)</td>
</tr>
<tr>
<td>5.</td>
<td>Cerebrovascular accidents</td>
<td>2 (2.8)</td>
</tr>
<tr>
<td>6.</td>
<td>Non-Hodgkin's lymphoma</td>
<td>1 (1.4)</td>
</tr>
<tr>
<td>7.</td>
<td>Multiple myeloma with chronic renal failure</td>
<td>1 (1.4)</td>
</tr>
</tbody>
</table>

Six patients had more than one co-morbid conditions.

The mean duration of symptoms was six days (range <1-30 days). Duration of hospital stay ranged from 2-21 days with a mean of 9.11 days. 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. Six patients in the study were having presenting symptoms not confined to respiratory system and included three patients presenting exclusively with history of altered sensorium, two patients with loose motions and one patient with acute abdominal pain.

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. Twenty-four (34%) patients were already receiving antibiotics at the time of admission. 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. Seven patients also had pleural effusion.

Of the 70 patients with CAP, 60 (85%) had an uneventful course. However, 10 patients had one or more complications related to CAP. These included empyema and shock in three patients each, pulmonary embolism (diagnosed by Doppler-echocardiography), and septic arthritis in two patients each.

Various haematological and biochemical abnormalities were observed in 23 (33%) patients. These included anaemia (n=12), leucocytosis (n=8), leucopenia (n=1), abnormal liver function (n=13) and abnormal renal function (n=7) tests. Eleven patients had more than one abnormality.

Gram's staining revealed that sputum originating from the lower respiratory tract, suitable for diagnostic testing could be obtained in 66 (94%) patients. In six patients who could not produce adequate sputum inspite of sputum induction, bronchoscopic aspirate was subjected to culture and sensitivity testing. Sputum culture was positive in 47 (71.2%) of the 66 samples subjected to culture, six patients had evidence of more than one pathogen.

Blood culture was performed in all 70 patients but only six cultures yielded positive
result (*Staphylococcus aureus* in five, and *Klebsiella pneumoniae* in one patient).

Pleural fluid specimens were available from seven (10%) patients. Pleural fluid from two patients grew *Staphylococcus aureus*.

Serum from eight patients was positive for *Mycoplasma pneumoniae* specific IgM antibodies on ELISA, with the corrected optical density (OD) more than the cut off value (0.331). None of the control samples were positive. Seven of the eight patients with positive *Mycoplasma* serology were younger (age range 17-32 years). Of these eight patients, three cases presented with extra-pulmonary symptoms in the form of nausea, vomiting and loose motions while five cases had characteristic features of typical pneumonia. Chest radiograph revealed interstitial infiltrates in five and lobar pattern in three patients.

Of the 70 patients studied, etiological diagnosis could be established in 53 (75%) (Table 2). Twelve patients had evidence of mixed infections. The most common pathogen was *Streptococcus pneumoniae* (n=19; 35.8%) followed by *Klebsiella pneumoniae* (n=12; 22.6%) (Table 2).

***DISCUSSION***

Despite the use of conventional methods, invasive procedures and serology, microbiological diagnosis of CAP could be confirmed only in 75.7% of patients. Similar observations were reported in a previous study. Even with the use of extensive laboratory testing and various invasive procedures, etiological confirmation could be achieved in no more than 45%-70% patients. However, studies from Israel and Saudi Arabia reported a microbiological diagnosis in over 80% of the patients. *Streptococcus pneumoniae* was the most common pathogen isolated in the present study (35.8%). Studies from the USA and the UK have reported isolation rates for *Streptococcus pneumoniae* ranging from 39% to 75%. Kulpati and Khastgir in a survey of CAP in India reported that *Streptococcus pneumoniae* is the most common isolated pathogen responsible for 40-60% of cases. The second commonest pathogen isolated in this study was *Klebsiella pneumoniae* (n=12; 22.6%). Studies reported during the last two decades from India have also reported a higher prevalence of *Klebsiella pneumoniae* among culture positive pneumonias.

Of the 23 patients in whom Gram negative bacilli were the etiological cause, 17 patients (74%) were more than 40 years of age, 16 (70%) were smokers; 18 (78%) were having one or more underlying co-morbid conditions with COPD being the most common among them.

Majority (70%) of the patients from whom Gram negative bacilli were isolated (n=23) were older than 40 years of age, were smokers or had COPD. It has been reported that old age, smoking and underlying respiratory diseases such as COPD impair pulmonary defenses and predispose to CAP caused by Gram negative pathogens.
The patients showing serological evidence of *Mycoplasma pneumoniae* infection (n=8) were younger, manifesting interstitial pattern of lung infiltration more commonly along with extrapulmonary symptoms. However, it was difficult to categorise patients into “typical” and “atypical pneumonia” on the basis of presenting clinical features, radiological and routine laboratory tests. In two Indian studies from New Delhi the prevalence of *Mycoplasma pneumoniae* has been reported in 35% of cases in adults\(^1\) and 27.4% in children\(^2\).

In this study factors such as old age, smoking and underlying COPD were significantly associated with CAP (p<0.01). Patients in the older age groups are more susceptible to Gram negative pneumonia because of the effect of aging on immunity and pulmonary defenses, underlying chronic diseases, silent aspiration, increased exposure to antibiotics and institutional care\(^4\). Smoking is a well known and important risk factor for CAP through alterations in mechanisms of the host defence system\(^21\). Almirall *et al\(^22\)* reported that even in persons without COPD, the proportion of CAP cases attributable in the population to ever having consumed any type of tobacco was 23% (95% confidence intervals 3.3 to 42.7%). Alterations in the immune system and inflammatory functions in smokers are well known. Tobacco smoking is the most important risk factor for the development of COPD\(^23\) and it is recognised as a risk factor for other respiratory infections. Both smoking and COPD are predisposing risk factors for CAP\(^24\).

The mortality from pneumonia is high particularly in the elderly and in patients with associated co-morbid conditions. Bacteremic pneumonia, severe CAP requiring intensive care unit (ICU) admission, spread of radiographic infiltrates and previous treatment with immunosuppressive drugs have all been associated with a poor outcome\(^25\). The mortality in our study was 11 per cent. However, we did not include the patients on immunosuppressive therapy and none of the patients studied required ICU admission. Mortality due to CAP in various hospital based studies has been variable. While the British Thoracic Society multi-centric study recorded a surprisingly low mortality of 5.7%, where as higher mortality (ranging from 21% to 25%) has been reported in other studies \(^{26, 27}\). However, in another Indian study a significantly higher mortality was noticed in patients aged 50 years or above and in those with underlying co-morbid conditions\(^28\). According to the study conducted by British Thoracic Society and the Public Health Laboratory Services\(^29\), patients had a 21 fold increased risk of mortality if they had respiratory rate 30 breaths per minute or more and diastolic blood pressure less than or equal to 60 mm of Hg. In the present study, only 24% patients were having respiratory rate more than 30 breaths per minute and 13% patients were having evidence of hypotension (diastolic blood pressure < 60 mm of Hg). Thus, meticulous recording of the respiratory rate and blood pressure at the time of initial evaluation and careful monitoring thereafter will be helpful in reducing the mortality associated with CAP. Our observations will also be useful to monitor the trends of CAP in the population of the region and will help the physicians to start rational empirical treatment for patients with CAP.

**REFERENCES**


