

THE CLINICAL PROFILE AND SEVERITY OF COMMUNITY ACQUIRED PNEUMONIA IN SPECIAL REFERENCE WITH PNEUMONIA SEVERITY INDEX

Jayaprasad Rajarajan¹, Daranendran Chellappa²

¹Assistant Professor, Department of Medicine, Government Villupuram Medical College and Hospital, Tamilnadu.

²Assistant Professor, Department of Medicine, Government Villupuram Medical College and Hospital, Tamilnadu.

ABSTRACT

BACKGROUND

Community Acquired Pneumonia (CAP) is the infection of lung parenchyma in an individual who has not recently been hospitalised. The mortality of CAP in hospitalised patients is 14% and those admitted in ICU increases to 20% - 50%. In developing countries like India, an incidence of 20% - 30% is reported as compared to 3% - 4% in developed countries.

The objectives of the study are:

- 1) To know the clinical profile of the patients admitted with pneumonia in a tertiary care hospital.
- 2) To triage the patients and predict the outcome using pneumonia severity index (PSI).
- 3) To study the correlation between PSI and ICU admission, death and mortality at 30 days and followup.
- 4) To compare the results like age and sex distribution, outcomes, deaths etc. with similar studies.

MATERIALS AND METHODS

50 patients admitted in a tertiary care centre in south India with signs and symptoms of pneumonia were included in the study. After obtaining history and examination, the patients were subjected to relevant investigations. Patients were followed up for 30 days. For statistical analysis, the Chi-square test was used. The statistical significance was set at 0.05 level and the confidence interval at 95%. The baseline parametric variables were expressed in percentages.

RESULTS

The common age group affected was between 40 to 65 years of age, of which males account for 62.5%. Cough was the most common presenting symptom followed by difficulty in breathing, fever and chest pain. Culture and gram staining of sputum were positive in 30% and 50% respectively. Commonly associated comorbidities were heart failure and renal disease, diabetes mellitus being the commonest risk factor.

CONCLUSION

PSI (Pneumonia Severity Index) scoring correlates well with the mortality and morbidity at followup on the 30th day. It was also effective in deciding whether the patient deserved ICU care.

KEYWORDS

Community Acquired Pneumonia, Pneumonia Severity Index.

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BACKGROUND

The parenchymal infection of the lung is called pneumonia. Despite being the cause of significant morbidity and mortality, pneumonia is often misdiagnosed, mistreated and underestimated. Community Acquired Pneumonia (CAP) is the infection of lung parenchyma in an individual who has not recently been hospitalised. The mortality of CAP in hospitalised patients is 14% and those admitted in ICU increases to 20% - 50%.⁽¹⁻³⁾

In developing countries like India, the incidence of about 20% - 30% is reported as compared to 3% - 4% incidence in developed countries.⁽⁴⁻⁶⁾ The incidence varies markedly with age. Children upto 4 yrs. of age shows an incidence of

20/1000 patients per year, after which it drops to 1 - 4/1000 per year in young adults after 40 yrs. of age. It gradually rises to about 15 - 30/1000 in 75 - 79 yrs. of age and 40 - 60/1000 in people over 85 yrs. of age.⁽⁷⁾

The cause of CAP is often difficult to establish even with the use of extensive lab investigations and invasive procedures, the aetiological confirmation being achieved in no more than 45% - 70% of the patients with CAP. The aetiology of CAP remains uncertain in many patients.⁽⁸⁾ Common causes are bacteria, viruses, fungi and parasites.

The clinical manifestations are cough, fever, difficulty in breathing and chest pain accompanied by constitutional symptoms. Specific signs of pulmonary consolidation are present only in 1/3rd of the cases that need hospitalisation and less frequently in less ill patients.⁽⁹⁾

Severity assessment is one of the early steps in the management of CAP. There are currently 16 published prediction rules available, but most of these rules are not useful for triaging. Some of the commonly used scorings are-

1. Pneumonia Severity Index (PSI).
2. m-BTS (British Thoracic Society).
3. ATS (American Thoracic Society)- ICU admission criteria.
4. CURB- 65 etc.

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Corresponding Author:

Dr. Daranendran Chellappa,

Assistant Professor,

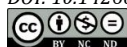
Department of Medicine,

Government Villupuram Medical College,

Mundiyampakkam.

E-mail: daranendran@yahoo.com

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The different outcomes that are to be studied are-

1. Death.
2. Need for ICU care.
3. Duration of hospital stay.
4. Need for ventilator (or) inotropic support.

An early empirical therapy with routinely used antibiotics is usually effective while waiting for lab results.

The aim and objectives of the study are: 1) To know the clinical profile of the patients admitted with pneumonia in a tertiary care centre in south India; 2) To triage the patients and to predict the outcome using pneumonia severity index (PSI); 3) To study the correlation between PSI and ICU admission, death and mortality at 30 days and followup of the patients; 4) To compare the age and sex distribution, outcomes, deaths etc., with similar studies done before.

MATERIALS AND METHODS

Setting

Fifty patients of community acquired pneumonia, admitted in a tertiary care hospital, satisfying the inclusion and exclusion criteria were selected for the study. After obtaining history and examination, patients were subjected to relevant investigations.

Inclusion Criteria

Patients presenting with any opacity on chest radiograph associated with respiratory symptoms and signs suggestive of pneumonia were included in the study.

Exclusion Criteria

1. Patients < 12 years of age.
2. Pregnant women.
3. HIV patients and sputum positive pulmonary TB patients.
4. Chronically immunosuppressed patients (solid organ transplanted patients, post-splenectomy patients).
5. Patients hospitalised within the previous 14 days for other illness.
6. Patients with an alternate diagnosis during followup.

Study Design

A clinical, prospective, observational study on community acquired pneumonia were admitted in our hospital.

Study Protocol

Fifty patients of community acquired pneumonia admitted in our hospital satisfying the inclusion criteria were included in the study. At the time of initial evaluation, the selected patients underwent a complete clinical history and examination, chest radiograph (posteroanterior view) at presentation, serum electrolytes, sputum for gram staining and culture, complete blood count, blood culture and Arterial Blood Gas analysis (in selected patients) were done.

Other investigations like pleural fluid analysis and bronchoalveolar lavage were done depending on the clinical scenario of the patients.

The pneumonia severity index was calculated for all the patients.

Patient Characteristics	Points
Demographics Age (years): Male: age Female: age Nursing home resident	Age (yrs.) Age (yrs.)-10 +10
Co-morbidities Neoplastic disease Liver disease Congestive heart failure Cerebrovascular disease Renal disease	+30 +20 +10 +10 +10
Physical Examination Altered mental status Respiratory rate > 30/min Systolic blood pressure < 90 mmHg Temperature < 35 or > 40 degrees C Pulse > 125/min	+20 +20 +20 +15 +10
Lab and Radiologic Findings Arterial pH (done only if hypoxic) < 7.35 BUN > 30 mg/dL Serum sodium < 130 mEq/L Glucose > 250 mg/dL Haematocrit < 30% PaO ₂ < 60 mmHg or O ₂ saturation < 90% Pleural effusion	+30 +20 +20 +10 +10 +10 +10
Table 1. Pneumonia Severity Index (PSI) Scoring³	

At the Clinical Endpoint (Hospital Discharge or Death) the following Parameters were recorded-

1. Duration of hospital stay.
2. Time taken for defervescence.
3. Need for mechanical ventilation.
4. Need for admission to ICU.
5. Condition at 30 days after discharge from hospital.

In the present study, in hospital death (or) death within 30 days of discharge was the main outcome. Need for ICU admission was studied as a marker for severe pneumonia. Defervescence is defined as resolution of fever, chest pain, respiratory rate ≤ 24/min, SPO₂ ≥ 90% on room air and ability to perform basic daily activities without support and also common presenting symptoms were observed.

A total number of 50 cases of pneumonia patients admitted at our hospital who met the inclusion criteria were studied.

Statistical Analysis

Statistical analysis was performed by Statistical Package for the Social Sciences (SPSS) version 20.0. The qualitative data were expressed as number (%), while the continuous quantitative data as mean ± standard deviation (SD) and the data was statistically analysed using Chi-square test. A p-value of < 0.05 was considered significant and at < 0.001 was considered highly significant.

RESULTS

Age and Sex Distribution

Out of 50 cases studied, 29 (58%) cases were males and 21 (42%) cases were females. The age ranged from 14 years to 80 years with a mean of 43.38 ± 16.43 years. The mean age of males (+SD) was 42.10 ± 17.0 and that of females was 45.14 ± 15.93 (Higher for female by 3 years). The ratio of male:female was 1.38:1. The maximum incidence was seen in the age group of 40 - 65 years (48%), of which 62.5% (15/24) of cases were males.

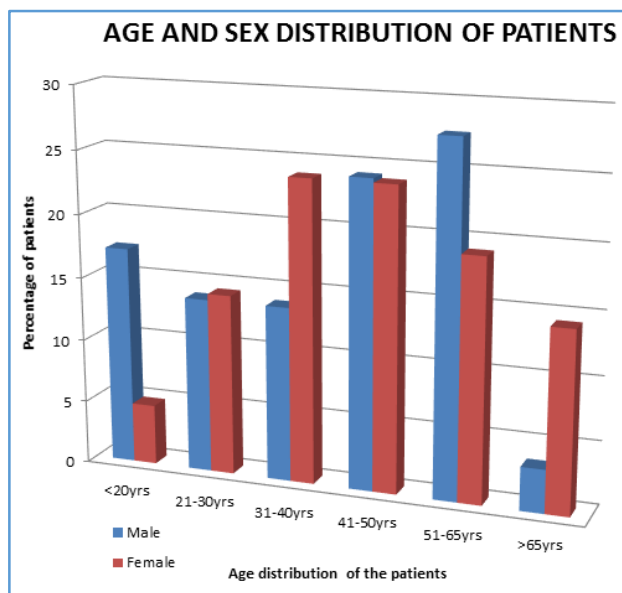


Figure 1. Age and Sex Distribution of Cases

Presenting Symptoms

Out of the 50 patients studied, the most common symptom was productive cough 96% (48/50) followed by difficulty in breathing accounting for 78% (39/50). The other symptoms were in the order of fever 76% (38/50), chest pain 74% (37/50) and 52% (26/50), 40% (20/50), 20% (10/50) for headache, myalgia and haemoptysis respectively. Gastrointestinal symptoms like nausea and diarrhoea occurred in 38% (19/50) and 8% (4/50) respectively.

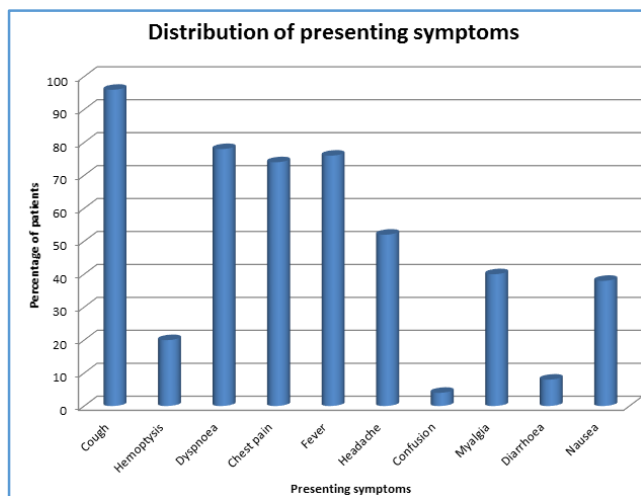


Figure 2. Symptoms at the Time of Presentation

Associated Co-Morbidities

In this study, the commonly associated co-morbidity was diabetes mellitus (10%) followed by renal disease and heart failure, each accounting for 6%. Malignancy co-existed with 4% of cases. COPD and liver disease were associated with 2% of cases each.

X-Ray Chest

In our study, upper lobe involvement was seen in 8% (4) and the middle lobe involvement was seen in 24% (12) and the most commonly involved lobe was the lower lobe 36% (18). Bilateral lesions occurred in 14% (7) in the study group and pleural effusion occurred in 28% (14). Cavitory lesions were seen in 10% (5) of the patients. The right side was more commonly involved than the left.

Microbial Testing

In the present study, gram stain positivity was 50% and culture positivity was found to be 30%.

Complications of Pneumonia

Complications	Male	Female	Total	%
Pleural effusion	7	7	14	28%
Empyema	1	0	1	2%
Lung abscess	1	0	1	2%
Respiratory failure	2	1	3	6%
ARDS	1	0	1	2%
Death	0	1	1	2%

Table 2. Sex Wise Distribution of Complications of Pneumonia

In our study, pleural effusion was seen in 28% of the patients with pneumonia followed by respiratory failure in 6% of the patients. Other complications like empyema, lung abscess and ARDS occurred in 2% of the patients each. Death occurred in 2% of the patients.

Organisms Recovered on Sputum Culture

In our study, S. pneumoniae was recovered in 14% of the cases. P. aeruginosa and S. aureus were isolated from 6% and 4% respectively, K. pneumoniae and gram negative enteric bacilli from 4% and 2% of the patients respectively. Mixed and other infection constitute for 14% and 12% respectively.

In our study, renal and heart failure were the comorbidities associated with 6% of the patients followed by malignancy and liver disease constituting 4% and 2% respectively.

On physical examination, commonly occurring findings were an increased respiratory rate ($\geq 30/\text{min}$) in 18%, followed by increased pulse rate ($> 125/\text{min}$) and confusion each contributing 4%.

Among the lab findings increased urea was the commonest (68%), followed by decreased haematocrit (60%). The others were pleural effusion (28%) and decreased saturation, decreased arterial pH and increased glucose seen in 4% each.

Outcome of Pneumonia

In the present study (49/50) recovered that is 98% and 2% died.

In our study, class 1 pneumonia was present in 15 patients (30%). Class II and III pneumonia was seen in 22% and 24% respectively. It was 18% and 6% for class IV and V.

PSI Scoring in Study Patients

Mortality

In the present study, none of the patients belonging to class I, II, III, IV died of pneumonia. One out of 3 patients belonging to class-V died (33%).

Statistical Significance

Statistical test used: Chi-square test.

Sl. No.	PSI Score	OUTCOME				Statistical Inference
		Recovered (n=48)	Improved (n=1)	Expired (n=1)	Total (n=50)	
1	Class I	15 (31.3%)	0	0	15 (30%)	X ² = 20.602 Df= 8 0.008 < 0.05 Significant
2	Class II	11 (22.9%)	0	0	11 (22%)	
3	Class III	12 (25%)	0	0	12 (24%)	
4	Class IV	8 (16.7%)	1 (100%)	0	9 (18%)	
5	Class V	2 (4.2%)	0	1 (100%)	3 (6%)	

Table 3. Association between Outcome of the Respondents and their PSI Scores

Statistical test: Chi-square test

The above table shows that there is a significant association between outcome of the respondents and their PSI score (0.008 < 0.05).

Sl. No.	Duration of Hospital Stay	OUTCOME				Statistical Inference
		Recovered (n=48)	Improved (n=1)	Expired (n=1)	Total (n=50)	
1	Below 5 days	12 (25%)	0	1 (100%)	13 (26%)	X ² = 27.364 Df= 6 0.000 < 0.05 Significant
2	6 to 10 days	25 (52.1%)	0	0	25 (50%)	
3	11 to 15 days	10 (20.8%)	0	0	10 (20%)	
4	16 days and above	1 (2.1%)	1 (100%)	0	2 (4%)	

Table 4. Association between Outcome of the Respondents and their Duration of Hospital Stay

Statistical test: Chi-square test

The above table shows that there is a significant association between outcome of the respondents and their duration of hospital stay (.000 < 0.05).

Sl. No.	PSI Score	Age							Statistical Inference
		Below 20 yrs. (n=6)	21 to 30 yrs. (n=7)	31 to 40 yrs. (n=9)	41 to 50 yrs. (n=12)	51 to 60 yrs. (n=8)	61 yrs. and above (n=8)	Total (n=50)	
1	Class I	5 (83.3%)	4 (57.1%)	5 (55.6%)	1 (8.3%)	0	0	15 (30%)	X ² =48.775 Df = 20 0.000 < 0.05 Significant
2	Class II	1 (16.7%)	2 (28.6%)	1 (11.1%)	7 (58.3%)	0	0	11(22%)	
3	Class III	0	1 (14.3%)	1 (11.1%)	2 (16.7%)	5 (62.5%)	3 (37.5%)	12 (24%)	
4	Class IV	0	0	2 (22.2%)	1 (8.3%)	3 (37.5%)	3 (37.5%)	9 (18%)	
5	Class V	0	0	0	1 (8.3%)	0	2 (25%)	3 (6%)	

Table 5. Association between Age of the Respondents and their PSI Score Ratio

Statistical test: Chi-square test

The above table shows that there is a significant association between age of the respondents and their PSI score ratio (.000 < 0.05).

Age is one of the important variables taken into account for calculating PSI scoring. The commonly involved age group in this study was 40 to 65 years of age. By using a statistical test called Chi-square test, it is noted that there is a significant association between the age and the PSI scoring with a p value of 0.000 (< 0.05). Gender also showed significant association between duration of hospital stay using the Chi-square test with p value of 0.064 (< 0.05). Thus, age and gender play important roles in deciding the class of PSI scoring and duration of hospital stay.

On testing the significance between outcome and PSI scoring, there is significant association between outcome and the PSI scoring with p value of 0.008 (< 0.05) and also significant correlation between outcome and the duration of hospital study with p value of 0.000 (< 0.05).

DISCUSSION

The observations made in 50 pneumonia patients at our hospital were discussed and compared with other similar studies.

Age and Sex of the Patients

In the present study of 50 patients, 29 (58%) were males and 21 (42%) were females with a mean age of 43.38 ± 16.43. The

male: female ratio was 1.38: 1 and the maximum occurrence was seen in the age group of 40 - 65 years - 48% (24/50). Of these, males accounted for more cases of pneumonia, that is 62.5% (15/24). It is comparable with other studies like S Bansal et al,⁽¹⁰⁾ Viraphong et al⁽¹¹⁾ and Bochud PY et al.⁽¹²⁾ S Bansal in his study on clinical and bacteriological profile of CAP in Shimla, Himachal Pradesh, reported that the mean age for the patients with CAP was 52.77 ± 18.1 and male-to-female ratio was 2.4: 1.74 which was very much comparable with the present study.

Viraphong in South-East Asian J Trop Med Public health reported an average age of 49.5 and male: female ratio of 1:1.4. Bochud in the study of CAP, a prospective study stated that the average age was 43. All the studies are comparable with the present study.

Study Series	Total No. of Patients	Males (%)	Females (%)	Male: Female
Bansal et al	70	71.4	29.6	2.4:1
Present Study	50	58	42	1.38:1

Table 6. Showing Age and Sex Comparison of various Studies

Presenting Symptoms

The presenting symptoms of the patients with CAP are compared with Bansal et al study. The most common presenting symptom in Bansal study was cough (97%) and fever (90%). In our study, cough and fever were seen in 96% and 76% respectively. Percentage of patients presenting with cough is almost the same as that of the previous study, but that of fever is 14% lesser.

Difficulty in breathing, pleuritic chest pain and haemoptysis were present in 48%, 34% and 14% respectively in the previous study. In the present study it accounted for 78%, 74% and 20% respectively, which is more than that of previous study by 30%, 40% and 6% respectively.

Altered sensorium was seen in 12% patients in Bansal et al study and in 4% of patients in the present study. Loose stools was complained by 10% of patients, which was almost comparable with the present study (8%).

Presenting Symptoms	Bansal et al (%)	Present Study (%)
Cough	97	96
Fever	90	76
Dyspnoea	48	78
Chest pain	34	74
Haemoptysis	14	20
Altered sensorium	12	4
Diarrhoea	10	8

Table 7. Comparison of Symptoms in various Studies

Pattern of X-Ray Lesions

The various patterns of x-ray findings in the present study were 36% involvement of lower zone and 24% of middle zone and pleural effusion in 28%. In Bansal et al study too the commonly involved zone was the lower zone with 10% of cases showing pleural effusion, which was much lower than the present study.

Gram Staining and Sputum Cultures

In our study, the yield in gram staining and sputum cultures were 50% and 30% respectively. In many observational and retrospective studies of CAP, it was shown that an aetiological diagnosis had been established in less than 30% of hospitalised patients (Fine et al 1999; Lidman et al 2002).

Complications of Pneumonia

The various complications occurred to the patients in our study were pleural effusion (28%), empyema (2%) and respiratory failure (6%), which is comparable to Bansal et al in which empyema was seen in 3% of cases and pleural effusion in 10% of cases.

Organisms Recovered in Sputum Cultures

The organisms that were recovered from cultures were *S. pneumoniae* (14%), mixed infections (14%), *P. aeruginosa* (6%), *Klebsiella* and *S. aureus* each (4%) and Gram negative enteric bacilli (2%), which was comparable to Maurico Ruitz et al study which showed 29% of *S. pneumoniae*, 23% of mixed infections, 6% of gram negative enteric bacilli and 5% of *P. aeruginosa*.

Outcomes of Pneumonia

In our study 98% recovered and 2% died since many patients were class I, II, III (76%). So the mortality is low as compared with other studies.

PSI Scoring in all Patients

In our study 76% of cases were in class I, II and III. Class IV and V accounted for 18% and 6% respectively. One patient died in class V showing a mortality rate of 33% comparable to Fine et al study (29.2%).

PSI Scoring and Mortality

In many studies, it is proved that PSI is a better predictor of mortality. In our study too, it is proved. Studies like that done by Aujesky D et al⁽¹³⁾ did prospective comparison of three validated prediction rules for prognosis of CAP. It concluded that PSI had higher sensitivity and higher negative predictive value for mortality. Another study by Patel et al⁽¹⁴⁾ comparing PSI and CURB in 2005 concluded that PSI is the good indicator for assessing the mortality in CAP.

Limitations of PSI

1. With 20 variables, it is too complex to use.
2. It oversimplifies certain variables.
3. Patients may have other reasons for admission as in case of our study, in which many patients fell in first 3 classes of PSI (76%). Eg. Poor functional status, social support.
4. PSI is not applicable for certain cohorts.

CONCLUSION

Community acquired pneumonia is one of the commonest infections that we encounter in our day-to-day clinical practice, particularly in a developing country like India. It is also one of the leading causes of mortality and morbidity, particularly in the ICU setup.

In the present study, the commonly affected age group belongs to 40 - 65 years. But it can occur in any age group. There are many co-morbid conditions and risk factors, which

increase the chance of getting CAP and also decides the severity of illness.

Even though there are many advanced investigations available, many a time it is difficult to arrive at an aetiological diagnosis. Since sensitivity and specificity for the presenting symptoms and the clinical examinations are low, it is necessary to depend on chest radiography and other investigations to diagnose a case of pneumonia.

The next step is to immediately start therapy for CAP, since it is proved in many studies that early initiation of therapy resulted in a better outcome. Many a time, empirical antibiotics to cover the possible organisms are used. There are many prediction rules available to triage the patient and to take a decision. Some will be better in predicting mortality like PSI and others will be useful to know the need for ICU care, etc.

To summarise, the conclusions of the study conducted at our hospital in a study population of 50 patients admitted with symptoms and signs suggestive of pneumonia are-

The commonly affected age group ranged from 40 - 65 years (48%), in which males accounted for 62.5%. The age was 43.38 + 16.43. The male-to-female ratio was 1.38: 1.

The most common presenting symptom was cough (96%) followed by difficulty in breathing, fever, chest pain and haemoptysis. On bacteriological examination, the results were positive for 50% of cases in gram staining and 30% in case of culture. The organisms recovered from culture were in the order of *S. pneumoniae* (14%), mixed infections (14%), *P. aeruginosa* (6%), *Klebsiella* and *S. aureus* (4%).

The co-morbidities commonly associated were heart failure and renal disease followed by malignancy and liver disease. Diabetes mellitus was also present in significant number of cases.

Most of the cases were treated with cephalosporins and fluoroquinolones. About 76% of the cases came under class I, II and III of PSI. Remaining 24% were class IV (18) and V (6%). The mortality correlated well with the PSI scoring.

To conclude, by using the knowledge of these criteria patients with CAP can be better prognosticated and triaged to utilise the resources and appropriate treatment so that we can improve the outcome in this disease.

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