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Clinical Profile and Prognosis of Community-Acquired Pneumonia

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ABSTRACT

Introduction: Pneumonia is a disease known to mankind from ancient ages, Despite the availability of potent antibiotics, community-acquired pneumonia (CAP) remains a common and serious illness with significant morbidity and mortality, both in developing and developed countries. In the present study, we studied the occurrence, causes, clinical features and management issues of CAP.

Aims: To study the clinical, bacteriological, and radiological profile of CAP admitted in malnad area of south India.

Material and Methods: The study is conducted on 100 CAP patients admitted to various medical wards of the Mc Gann Hospital attached to Shimoga institute of medical sciences, Shimoga. From June 1st, 2019 to January 30th 2020. a detailed history was taken of all the patients and a thorough physical examination was done. blood is collected for analysis of CBC, Sr Creatinine, RBS, sputum Microscopy for Gram stain, Ziehl-Neelsen (Z-N) stain, Sputum culture is done, Chest radiograph (postero-anterior views) taken.

Result: There were 67 males and 33 females. The average age is 54.4 ± 14.57 years. The majority of these patients belong to the age group >50 years (68%). Smoking (45%), COPD (33%) and Diabetes mellitus (14%) are the commonest associations. Commonest symptom is cough(99%), fever(90%) followed by expectoration 87(87%) followed by dyspnoea(52%). *Streptococcus pneumonia* (40%) infection is seen in the majority. *Klebsiella pneumonia* in 30(30%) and GBM in 11(11%). Lobar pneumonia seen in 66(66%), Bronchopneumonia seen in 33(33%). Right lower lobe involvement is seen in 52 (52%) next common is multilobar involvement 29(29%).

Conclusion: The study concluded that *pneumococcus* found to be the most common organism causing pneumonia in our setup. There is an increased incidence of Gram-negative organism (*Klebsiella pneumoniae*) is seen in our hospital. Clinical features (cough, sputum, breathlessness) are seen in all age group of patients. Ageing predisposes to a higher risk of respiratory tract infection in individuals with smoking-related lung diseases and COPD. 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.

Key Words: CAP, Sputum, Cough, Pneumonia, Smoking, Gram-negative organism

INTRODUCTION

Pneumonia is a disease known to the Human race from antiquity. Pneumonia defines as “This is an acute inflammatory reaction of the pulmonary parenchyma that can be caused by various infective and noninfective origin.”¹

Even with the availability of a wide variety of antibiotics,² community-acquired pneumonia (CAP) remains a very common and lethal illness with quite a significant morbidity and mortality, in all the continents of the world. Community-

acquired pneumonia (CAP) is a leading cause of morbidity and mortality in persons aged over 60 years,³ with incidence and mortality rates increasing with growing age.⁴ Hospital admission is the greatest burden from pneumonia in terms of severity and health-care costs. Community-Acquired Pneumonia (CAP) is a common disease with an incidence of about 20- 30% in developing countries to an incidence of 3-4% in developed countries.⁵

Even though definite data is lacking, pneumonia remains a leading cause of death in our country.⁶ The mortality rate of

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the pneumonia patient, who is being treated as an outpatient (mild disease) is low, in the range of 1-5%, but among patient who requires admission to ICU is approaches 25%.⁷⁻¹⁰ With the beginning of the antibiotic era, the mortality rate decreased and remained in a constant state. Despite the progress made in the diagnosis of pneumonia, it takes a few days that to in tertiary care centres, to identify the causative micro-organism in the blood or sputum samples and the aetiology of many patients with CAP remains uncertain.² To make correct therapeutic decisions, physicians need reliable data on the prevalence of different etiological agents in the patients "locality," in addition to the clinical, laboratory, and radiological finding.⁷

Because the relative frequency of etiological agents differs in different geographical areas. There are many studies conducted to explain its clinical,

Microbiological agents and radiographic features in different population groups, whether these studies can be applied to our population is a real issue to be answered. Because of this, we needed a study on community-acquired pneumonia in our locality, and by doing this study we can help in the early detection of disease, and clinical, bacteriological, and radiological profile of CAP admitted in our geographical area can be known.

MATERIALS AND METHODS

The study is conducted on 100 consecutive patients admitted in various medical wards of the Mc Gann Hospital attached to Shimoga institute of medical sciences, Shimoga. From June 1st, 2019 to January 30th 2020.

INCLUSION CRITERIA:

Adult patient aged between 15 to 90 years in diagnosed as having Community-acquired pneumonia (CAP).

New or progressive chest infiltrates on chest X-ray with at least one of the following features:

1. Fever (temperature $>37.7^{\circ}\text{C}$)
2. Purulent sputum
3. Cough (H/O <14 days)
4. Leukocytosis (WBC $>11,000/\text{cumm}$).

EXCLUSION CRITERIA

1. Age less than 15 years,
2. Hospital-acquired pneumonia
3. Aspiration pneumonia
4. H/O pulmonary infarction, pulmonary tuberculosis, immune-compromised.

METHODS

One hundred patients admitted in Mc Gann district Hospital attached to Shimoga institute of medical sciences, Shimoga

having Community-acquired pneumonia (CAP) fulfilling the above criteria were taken into the study after taking consent from all the patients. Every patient's detailed clinical history and examination was done and routine investigations were done for all patients. Chest X-ray PA view is taken. Sputum microscopy and culture are done. Other tests like 2D-Echocardiography, Ultrasound abdomen were done where ever required. Every patient is evaluated in detail to arrive at a possible etiological diagnosis.

Statistical Analysis

Statistical analysis was done using the Chi-square test. the *p-value* of < 0.05 was considered statistically significant.

The statistical software SPSS 11.0 was used for the analysis of the data.

RESULTS

Demographic Data: The study group consisted of 100 patients, among whom

67 were males and 33 were females. They were studied from June 1st, 2019 to January 30th 2020. The male to female ratio is 2:1.

The age of patients ranges from 15 to 85, with the mean age 54.4 ± 14.57 years. Most patient 68 (68%) of CAP were elderly belong to >50 years age group (Fig 1).

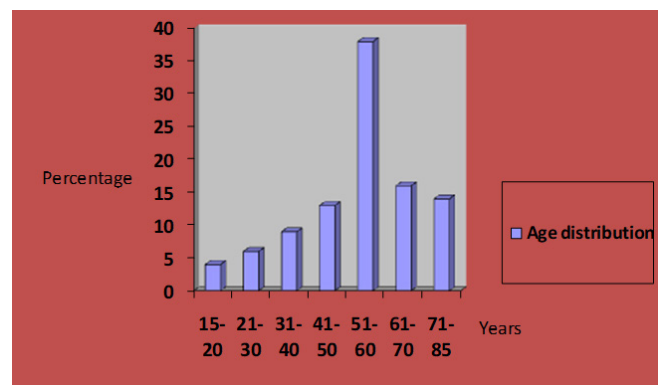


Figure 1: Showing the age distribution.

Incidence of symptoms

Cough was the most common symptom present in (99%) patients, followed by fever (90%), dyspnea (52%), expectoration (87%), fatigue (45%) and chest pain (15%). Other less common findings are haemoptysis (7%), cyanosis (5%). Chest pain was more common in younger than elderly age group patients.

In the study, chronic obstructive airway disease was the most common (33%), predisposing conditions. Other were

cardiovascular disorders (14%), diabetes mellitus (DM) (14%), Cerebrovascular accident (5%), and chronic liver disease (3%). Among habits, smoking was the most commonly noted in (45%) patient, followed by alcoholism in (12%) patients. Maximum smokers and drinkers were elderly belong to > 50 years age group.

Bacteriological incidence in percentage.

Streptococcus pneumonia(40%), *Klebsiella pneumonia*(30%), *Staphylococcus aureus*(15%), Gram-negative bacilli(11%), *Haemophilus influenza*(6%).

The etiological diagnosis was made possible only in 55 (45.8%) cases. The isolation of organisms done by sputum culture in 44 (36.7%), and by blood culture in 11 (9.1%). The commonest causative organism isolated was *Pneumococcus* 20 (36.4%) followed by *Klebsiella pneumonia* 16 (29%), *Staphylococcus aureus* 11 (20%), *Haemophilus influenzae* and Gram-negative bacilli 8 (14.5%).

Types of pneumonia according to Chest X-ray findings in patients with CAP

Lobar pneumonia seen in 66%, Bronchopneumonia seen in 28%, Interstitial pneumonia in 5%, Pleural effusion seen in 10% of patients (Fig. 2).

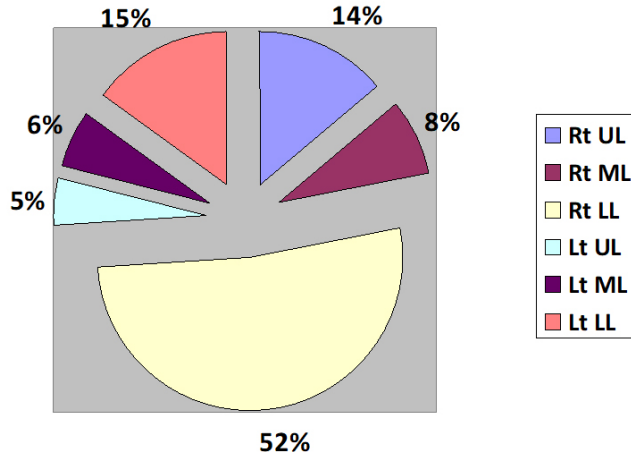


Figure 2: Lobular involvement according to Chest X-ray in patients with CAP.

(UL-Upper Lobe, ML-Middle Lobe, LL-Lower Lobe)

The right lower lobe of the lung is most commonly involved in CAP ($P < 0.0001$).

Bilateral lung involvement is seen in 19.8% of chest X-ray. Multiple lobes involvement is seen in 29 (29%).

There is no relation between the area of lung involvement and causative organism.

Prognostic factors and Mortality

Duration of stay varied from 3 days to 23 days (10 ± 7). Sepsis is seen in 17%. Lung abscess 4%, Pneumothorax 3%, Pleural effusion 30%, Respiratory support 45% (in the form of oxygen received by 33% patients, NIV in 7%, invasive ventilation in 5%). The death occurred in 7 patients. Sepsis and respiratory failure is the cause in 6, one had a myocardial infarction.

DISCUSSION

Age/Sex Incidence

In the study, 100 patients were observed, and the majority of patients 67 (67%) were males in comparison to the female population which were 33 (33%). The male to female ratio is 2:1. The mean age of patients was 54.4 ± 14.57 years. 68 (68%) belong to > 50 years of age group. It is well-documented that pneumonia incidence rises sharply with extremes of age (Table 1).^{11,12}

Table 1: Symptomatology

Symptoms	Our study Percentage	Fang et al ⁷ (%)	S. A. Skull et al ¹³ (%)	A B Dey et al ¹⁴	Aditya Bikram Mishra et al ¹⁵
Dyspnea	52	48	77.7	72	50
Fatigue	45	-	-	-	-
Cough	99	97	74.7	93	100
Chest pain	15	34	25.1	96	66
Cyanosis	5	27	-	17	-
Fever	90	90	65.7	78	100
Hemoptysis	7	14	-	-	-
Sputum	87	87	55.7	90	100

The most common symptom is Fever. Most of the symptoms presentations correlate with other studies.

Fever in 90 (90%), cough in 99 (99%) and expectoration in 87 (87%) patients. Other symptoms were shortness of breath in 52 (52%), pleuritic chest pain in 15 (15%), hemoptysis in 7 (7%), altered sensorium in 3, nausea, vomiting and loose motions in 2 and abdominal pain in 3 patients. This fact supported by some Indian and Western studies (Table 2).^{7,16,17}

Table 2: Correlation of predisposing risk factors in patient with CAP.

Clinical profile	In our study (%)	Jain et al ¹⁸ (%)	Fang et al ⁷ (%)	S A Skull et al ¹³ (%)
1 COPD	33	36	31	40
2 Diabetes mellitus	14	7	13	26.5

Table 2: (Continued)

	Clinical profile	In our study (%)	Jain et al ¹⁸ (%)	Fang et al ⁷ (%)	S A Skull et al ¹³ (%)
3	Cardiovascular disorders	14	17	14	46.6
4	CVA	5	2.5	8	21
5	Chronic liver disease	3	2.5	5	10
6	Smoking	45	41	55	70
7	Alcoholism	12	12	33	

This is the well-established fact that the majority of pre-disposing risk factors like cigarette smoking, alcoholism, chronic obstructive pulmonary disease, (COPD), coronary artery disease, etc., similar in all most studies. It is more common in middle-aged and elderly predominantly in males. This is by the earlier studies like Jain *et al.*,¹⁸ Fang *et al.*,⁷ S A Skull *et al.*¹³

The most common identified risk factor was smoking (45%), COPD (33%), cardiovascular diseases (14%), followed by DM (14%) and alcoholism (12%), there are many mechanisms which change regional and systemic respiratory antimicrobial immune function which causes respiratory infection. that is proved beyond doubt. These factors are not different in our locality, India or around the world.^{4,16,17,19.}

Table 3: Chest X-ray findings in patients with CAP.

Radiological Finding	Our study Percentage	A B Dey et al ¹⁴ (%)	O Sow et al ²⁰ (%)	S Bansal et al ²¹ (%)	S A Skull et al ¹³ (%)
Lobar pneumonia	66	42	84	80	35
Broncho-pneumonia	28	15	18		36
Interstitial pneumonia	5	7		20	1
Pleural effusion	10		16	10	

The radiological data in our study showed a predominance of lobar pneumonia in 66 (66%) patients followed by bronchopneumonia in 28 (28%) and interstitial pneumonia in 5 (5%) patients. Radiological information from our study emphasized by similar studies done by O Sow *et al.*²⁰ Bansal *et al.*²¹ Chest X-ray showing infiltrates is necessary to establish the diagnosis of pneumonia. However, it cannot differentiate between bacterial and nonbacterial pneumonia (Table 3).

Chest X-ray pattern of patients with CAP

In our study shows a significant correlation with Jain *et al* study. Right lower lobe involvement is commonly similar to Jain *et al.*¹⁸ studies. Maybe because this lobe has straight communication with the trachea. Organisms in more number get lodged in this lobe (Table 4).

Table 4: Etiological diagnosis

Sl	Bacteriological agent	Our study	Jain et al ¹⁸	S Bansal et al ²¹	Ruiz et al ²²
1	<i>Streptococcus pneumonia</i>	40	36.4	35.8	35
2	<i>Klebsiella pneumonia</i>	30	31.4	22.6	2
3	<i>Staphylococcus aureus</i>	15	20.4	17	5
4	Gram-negative bacilli	11	6.9	10	12
5	<i>Haemophilus influenza</i>	6	4.5	-	6

In a study, the microbial diagnosis of CAP was confirmed only in 40% of patients. This could be due to the limited use of laboratory tests, error in sample collection. Results of our study showed close resemblance to the study by Ruiz *et al.*²² In our study, we only used sputum and blood culture as diagnostic tools to identify the culprit organism that causes pneumonia. 32 (32%) isolated by sputum, and 8 (8%) by blood culture. But the fact is that even with the use of extensive laboratory testing and various invasive procedures, etiological confirmation could be achieved only in 45-70% of patients.^{2,23} The most common isolated pathogen was *S. pneumonia* accounting for 40%. Next common was *K. pneumonia* which accounts for 30% this followed by *S. aureus*, and other Gram-negative bacilli 15%, 11%, respectively (Gram-negative bacilli includes *H. influenzae*, *Pseudomonas*, *Acinetobacter*, *Escherichia coli*, *Enterobacter*, *Citrobacter* accounting 6%, 1%, 1%, 1%, 1%, 1% respectively). In the previous 3 decades many studies done in our nation showed the predominance of gram-negative organisms in culture-positive samples.²⁴⁻²⁷ there is more number of culture-positive Gram-negative bacteria in this study compared to studies were done in other nations (Table 5).²⁸

Table 5: Prognostic factors and Mortality

Percentage	Our study	Mbata et al ²⁹	Paula Peyrani et al ³⁰	Lamb A et al ³¹
Hospital stay (days)	10±7		10±8.3	
Lung abscess	4	8		2

Table 5: (Continued)

Percentage	Our study	Mbata et al ²⁹	Paula Peyrani et al ³⁰	Lamb A et al ³¹
Pneumothorax	3	4		2
Pleural effusion	30	32		12
Sepsis	17	24		6
Respiratory support	45			
ICU	22			24
Cured	93	75	83	94
Mortality	7	25	17	6

The prognosis outcome of CAP in our study is 7% mortality and 93% recovery rate. Joint ICS/NCCP (I) guidelines published in the year 2012 mentioned that mortality rates across India vary from 3.3% to 11%³². Duration of stay is almost similar to most of the studies with 3 to 4 days for mild cases, 10-15 days for severe diseases requiring ICU admission. Complication like lung abscess, pleural effusion, pneumothorax and sepsis varies with other studies, this can be explained by different organisms affecting, their antibiotic and use of different antibiotics and also patient immunity status. Most of the mortality is seen in diabetics, old age, anaemic and malnourished people.

CONCLUSIONS

The study is conducted on 100 consecutive patients admitted in various medical wards of the Mc Gann Hospital, Department of Medicine attached to Shimoga institute of medical sciences, Shimoga. From June 1st, 2019 to January 30th 2020. to know the incidence and prevalence of etiological organisms in CAP in our area, clinical features, and to know the relation between the involvement of a particular lung area with the causative etiological organism.

And the study concluded that *Pneumococcus* is the most common causative micro-organism in CAP, but there is an increase in the incidence of Gram-negative bacterial infection particularly by *Klebsiella pneumonia* is seen in our malnad area. Typical symptoms (cough, sputum, breathlessness) were common in both young and elder age group patients, Ageing predisposes to a higher risk of respiratory tract infection in individuals with smoking-related lung diseases and debilitating non-respiratory diseases. 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.

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Authors contribution

Dr Ranjith kumar G K. had full access to all of the data in the study and takes responsibility for the integrity of the data and the accuracy of the data analysis. Dr Rashmi Gk, Dr Es-hwarappa, Dr Nagabhushana S contributed substantially to the study design, data analysis and interpretation, and the writing of the manuscript.

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