Original Research Article

A study of non tuberculous bacterial pneumonia cases admitted in department of pulmonary medicine at a tertiary care hospital

Kuraganti Chakravarthi*

Assistant Professor, Department of Pulmonary Medicine, Rangaraya Medical College & Govt General Hospital, Kakinada, Andhra Pradesh, India

Received: 17-06-2021 / Revised: 22-07-2021 / Accepted: 20-08-2021

Abstract

Background: Pneumonia is an infection of the pulmonary parenchyma. Despite being the cause of significant morbidity and mortality, pneumonia is often misdiagnosed, mistreated and underestimated· **Aim: The main aim of the present study was to** the impact of co morbid conditions on the prevalence of type of pneumonia, its severity and its outcome**. Materials and Methods:** This study entitled "Study of Non Tuberculous Bacterial Pneumonia cases admitted in Department of Pulmonary Medicine at Rangaraya Medical College and Hospital, Kakinada, during the period August 2018 to July 2020. All the cases of CAP admitted during this period in the medical wards were randomly selected and studied with patient consent. A detailed analysis of history, clinical examination bacteriology, radiology (CXR PA and lateral, CT) were done. **Results:** All the findings of this study were compared to similar studies done at other centres in India and abroad and available literatures were reviewed. The age group in this study group varied from 27-80 years, most of them were between 30- 65 years, predominantly middle and elderly age accounting for 96%. The incidence of pneumonia is most common in men (77%) compared to females (23%). The associated diseases in this study are COPD (35%) & DM (22.0%). The commonest presenting symptoms are cough (100%), expectoration (100%), fever (60%) other symptoms include dyspnoea (45%), and chest pain (13%). The haematological value showed leucocytosis (35%). The Sputum culture showed 23% streptococcal, 26% staphylococcus aureus, 9% pseudomonas, 13% Klebsiella, 16% normal comensols and 7% mixed, staphylococcus and klebsiella (5%), citrobacter(1%). Radiology showed preponderance of the rt. lung involvement and rt. Upper, middle and lower lobe accounting for about 42%. **Conclusion:** Medical line of treatment in appropriate time and with appropriate antibiotics and ventilator support in few patients. Duration of hospital stay increased in patients with co morbidities. Patients requiring ICU treatment in this present study include 15 (15%) of which 11 (11%) required ventilator support mortality encountered in 4(4%).

Keywords: Pneumonia, Klebseilla, Citrobacter, Radiology, Tuberculous.

Introduction

Pneumonia is an acute inflammation of the pulmonary parenchyma that can be caused by various infective and non-infective origins, presenting with physical and radiological features compatible with pulmonary consolidation of a part or parts of one or both lungs[1].

Pneumonia is an infection of the pulmonary parenchyma. Despite being the cause of significant morbidity and mortality, pneumonia is often misdiagnosed, mistreated and underestimated[2].

Pneumonia is a common cause of infection-related mortality and is one of the most important challenges in clinical medicine. Inappropriate or delayed treatment of pulmonary infection contributes to poor clinical outcomes, avoidable drug exposures, and emergence of antimicrobial resistance[3].

Pneumonia is one of the leading causes of death and morbidity, both in developing and developed countries and is the commonest cause (10%) of hospitalization in adult and children[4].

In the late twentieth and twenty first century newer microbial agents have emerged like - opportunistic lung infection in patients with HIV infection and in post organ transplant patients [5].

*Correspondence
Dr. Kuraganti Chakravarthi
Assistant Professor, Department of Pulmonary Medicine, Rangaraya Medical College & Govt General Hospital, Kakinada, Andhra Pradesh, India.
E-mail: targetgold99@gmail.com

This study is to understand the mode of presentation, its clinical features, bacteriological and radiological features for the early detection of pneumonia, the causative agent and to study its complications. This study also involves the impact of co morbid conditions on the prevalence of type of pneumonia, its severity and its outcome.

Aims and objectives of the study

Aim of the study

- To assess the clinical and radiological patterns of pneumonias.
- To study the risk factors and their outcome.
- To assess the spectrum of organisms.
- Treatment.

Objective of the study

The present study is undertaken to study the mode of presentation, its clinical features, bacteriological and radiological features for the early detection of the pneumonia and the associated co morbidities, its impact on outcome.

Materials and Methods

Sample size

100 cases admitted in wards and ICU in Department of Pulmonary Medicine in Rangaraya Medical College and Hospital, Kakinada.

Study type

Observational study – cross sectional study

Study period

August 2018 to October 2020.

Inclusion criteria

Adult males and females aged more than 18 years admitted with acute and chronic respiratory symptoms presenting with pulmonary shadows in x-ray. Some of them are admitted for the first time without a background of previous pulmonary or systemic disease, while others have background of pulmonary illness like COPD. Some are admitted with background of diabetes, coronary artery disease, and chronic kidney disease.

Exclusion criteria

Patients < 18 years were excluded. Patients with pulmonary tuberculosis and extra pulmonary tuberculosis were excluded. Patients with viral and fungal pneumonias were excluded. Patients with ventilator associated pneumonia, HIV patients with pneumonia were excluded. Ethical clearance is obtained from Rangaraya Medical College, Kakinada.

Statistical software

Chi-square and Fisher exact test have been used to test the significance of percentage various parameters. Odds Ratio (OR) has been used to find the strength of relationship of clinical, radiological and bacteriological presentation.

p>0.05 No significance p<0.05 significance p<0.01 highly significant

Procedure

After recruitment for the study a thorough physical examination is done and routine investigations were carried out. The patients were subjected to the following examination. All the patients were subjected for detailed clinical examination to make a provisional diagnosis of Community Acquired Pneumonia (CAP) and Hospital Acquired Pneumonia (HAP).

- Sputum for Gram stain, AFB, and Culture were done.
- Blood for WBC Count and Differential Count were done.
- Chest X-ray done to know the Site of consolidation.
- ELISA was done to rule out HIV infection.

Results and observations

A cross sectional clinical study in 100 patients with respiratory symptoms is undertaken to investigate the magnitude and pattern of clinical, radiological and bacteriological presentation of non tuberculous bacterial pneumonia admitted in department of Pulmonary Medicine, Rangaraya Medical College and Hospital, Kakinada.

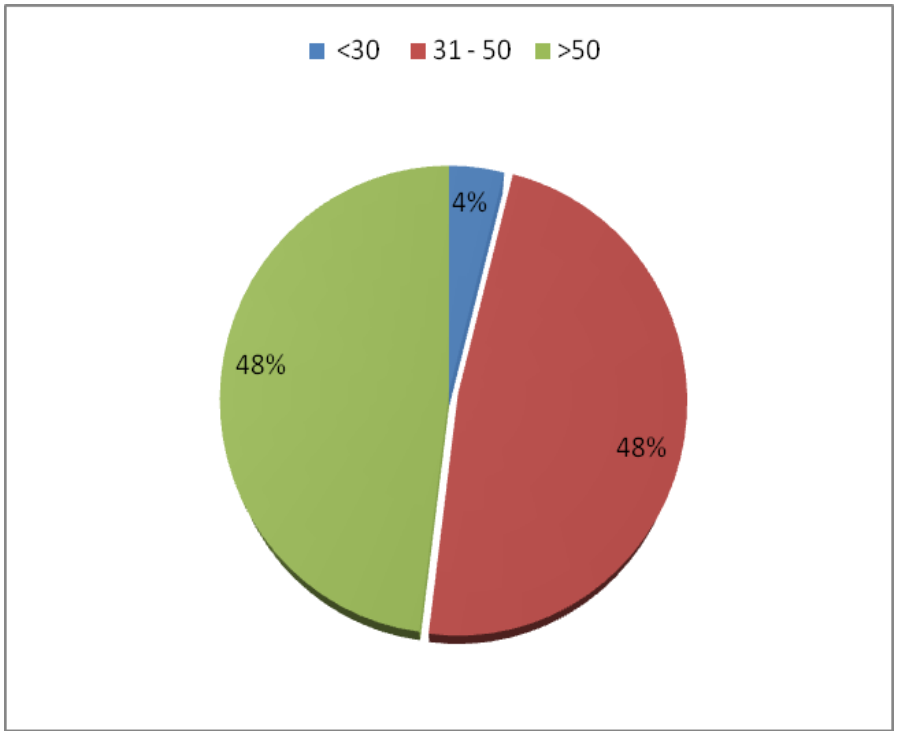

Fig 1: Age distribution in Pneumonia

Among 100 patients diagnosed as pneumonia 48% each were in the age group of 31-50 yrs and >50yrs respectively and remaining 4% were in the age group of <30 yrs.

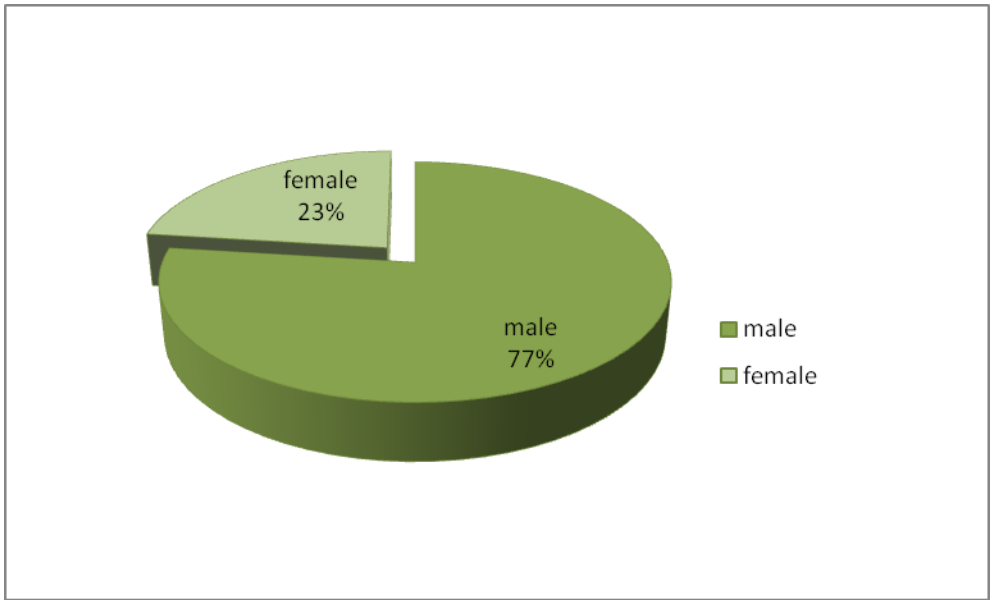

Fig 2: Sex distribution in Pneumonia

Out of 100 patients studied for pneumonia, male were 77% (77) and femalewere 23% (23)

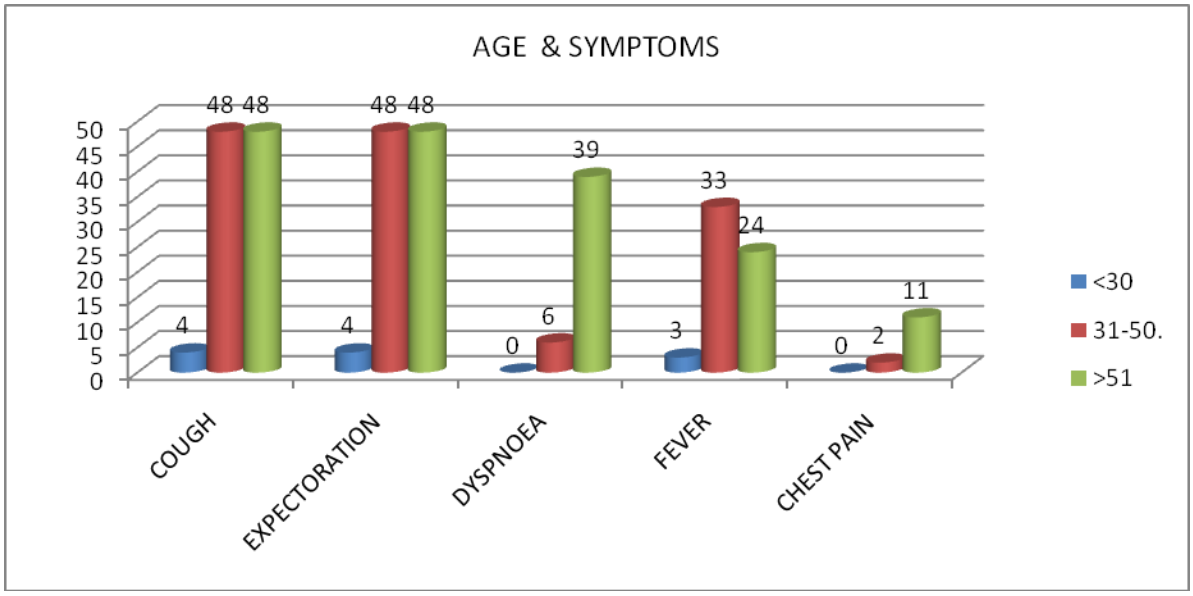

Fig 3: Clinical features of pneumonia in different age groups

Table 1: Symptomatic presentation of pneumonia in this study

Symptoms	< 30 years	31-50 years	>50 years	Total
Cough	04 (4%)	48 (48%)	48 (48%)	100 (100%)
Expectoration	04 (4%)	48 (48%)	48 (48%)	100 (100%)
Dyspnoea	00	06 (06%)	39 (39%)	45 (45%)
Fever	03 (3%)	33 (33%)	24 (24%)	60 (60%)
Chest pain	00	02 (2%)	11 (11%)	13 (13%)

Almost all the patients had cough, expectoration 100%, dyspnoea is significantly common in elderly pneumonic patients with $p < 0.001$ and chest painalso common in elderly age group $p < 0.05$.

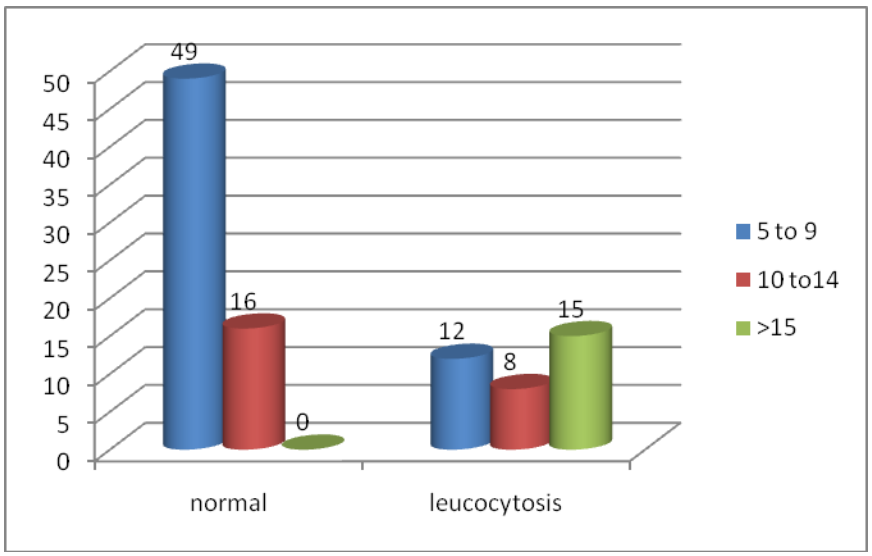

Fig 4: WBC Count and duration of hospital stay (in days)

Patients with normal leukocyte count have shorter duration of hospital stay compared to marked leucocytosis patients having longer duration of hospital stay (>15 days) with significance of $p < 0.001$.

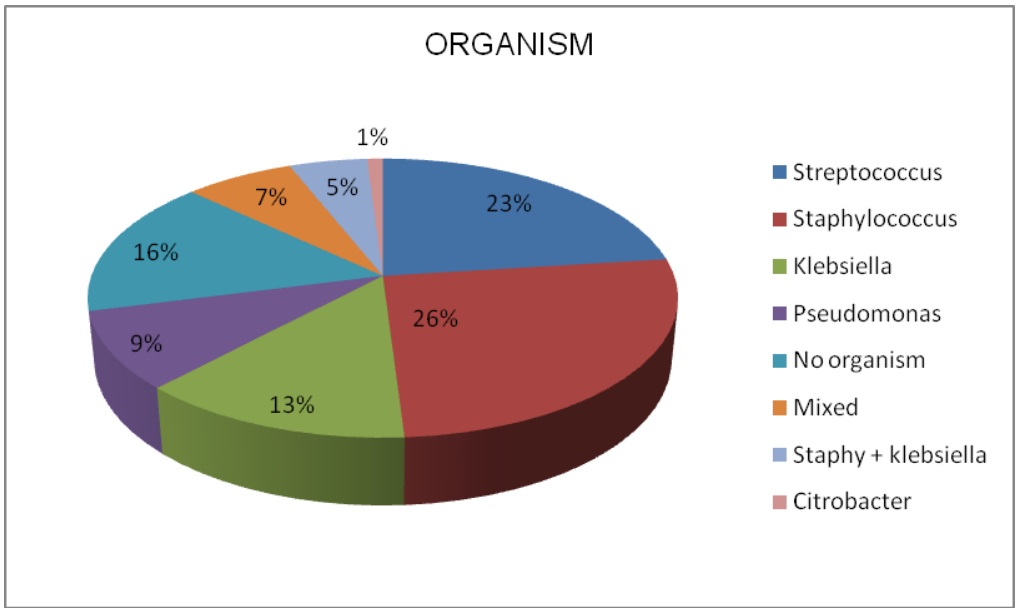

Fig 5: Sputum culture report

Table 2 : Sputum culture report of this study

Sputum culture	Percentage
Streptococcus	23%
Staphylococcus	26%
Klebsiella	13%
Pseudomonas	9%
No organism	16%
Mixed	7%
Staphy + klebsiella	5%
Citrobacter	1%

Sputum culture report showed Staphylococcus (26%) as the most common organism as causative agent , followed by Streptococcus (23%), no organism was found in 16%, Klebsiella (13%), Pseudomonas (9%), mixed organisms (7%), staphy + klebsiella (5%), Citrobacter (1%).

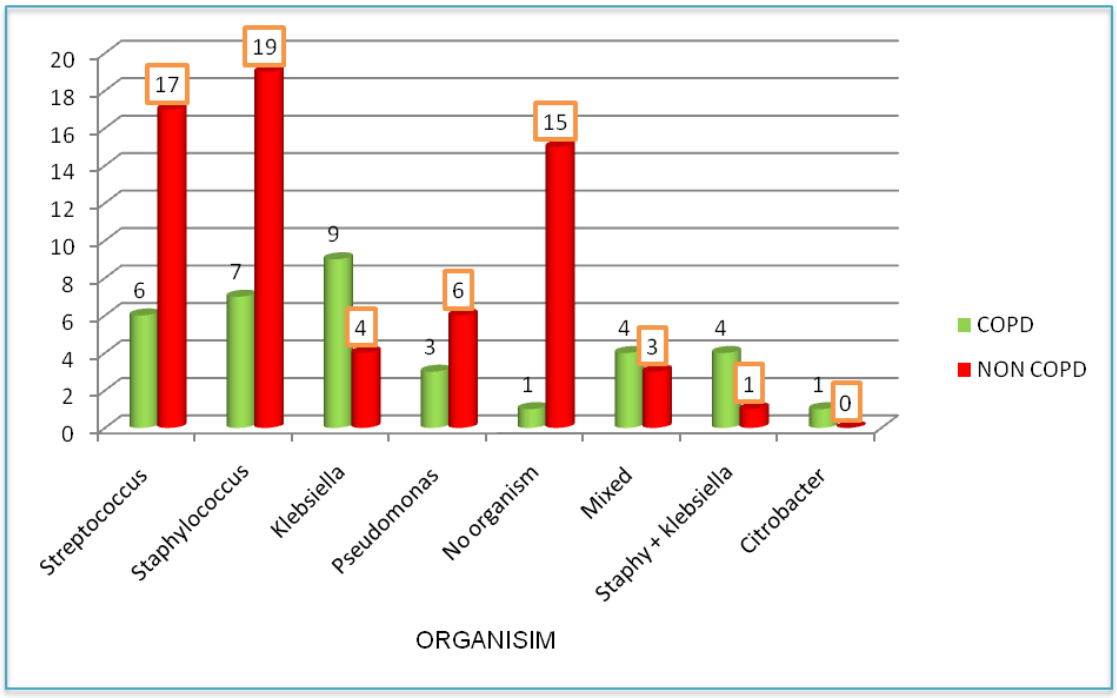

Fig 6: COPD and isolated organism

In this study, among 35% of pneumonia with COPD patients, the most common organism isolated is klebsiella (9%), followed by staphylococcus (7%), streptococcus(6%), 4%each of mixed gram positive and gram negative organism, staphylococcus + klebsiella, pseudomonas (3%),citrobacter (1%), no organism was found in 1% of patients.

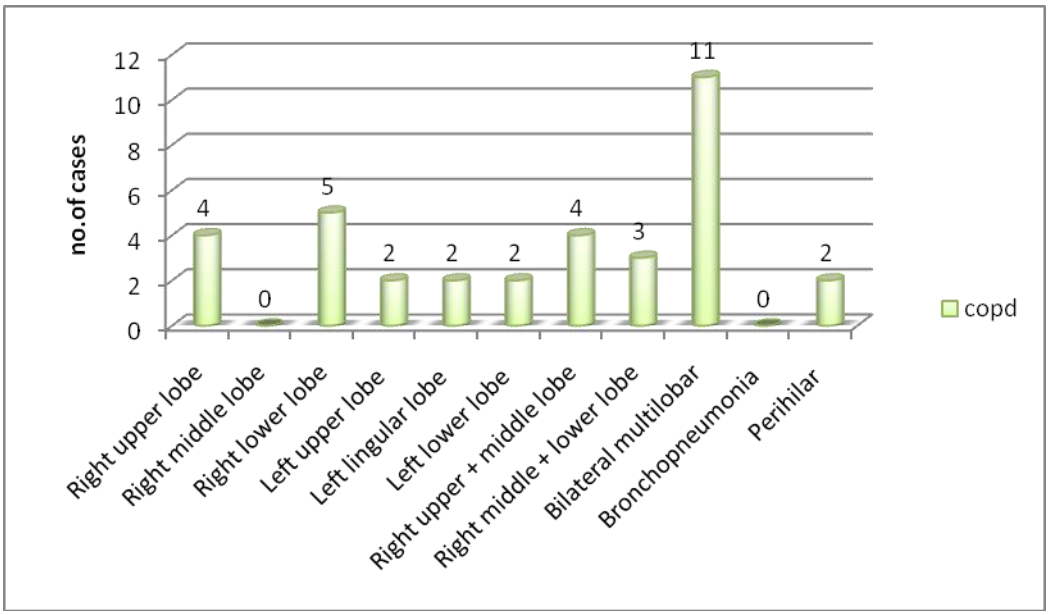

Fig 7 : COPD and Radiological report

This study has 35 COPD patients with pneumonia of which most common radiological presentation is bilateral multilobar compared with non COPD patients, ($p< 0.05$).

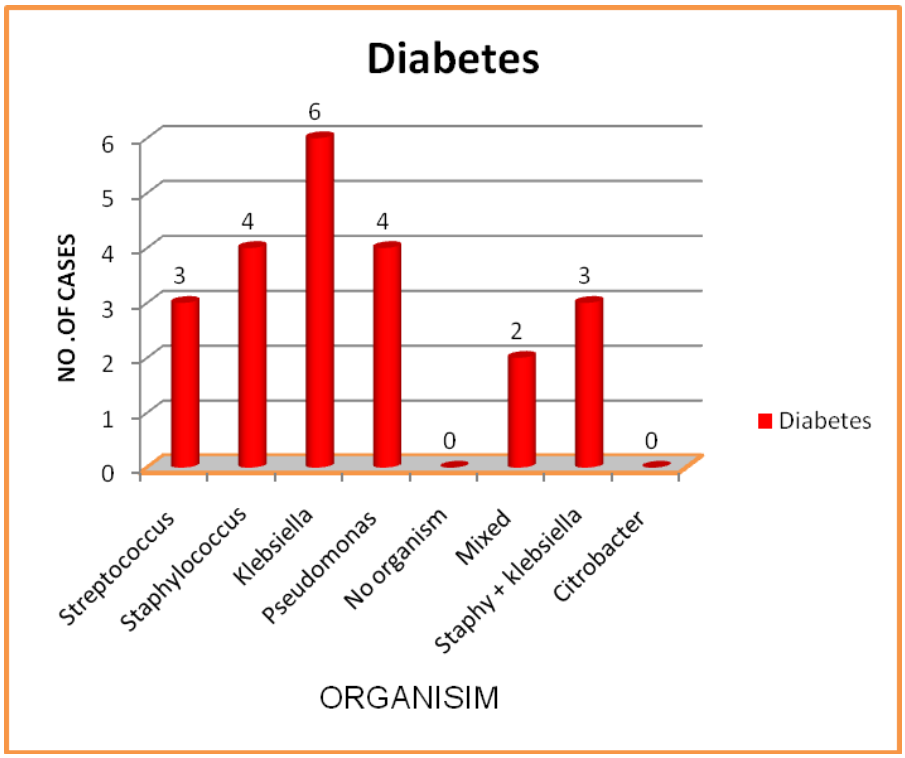

Fig 8: Diabetes and isolated organism

Sputum culture in 22 patients with pneumonia associated diabetes revealed klebsiella as most common organism — 6 cases, staphylococcus and pseudomonaseach of 4 cases, 3 each of streptococcus and staphylococcus + klebsiella each andmixed gram positive and gram negative in 2 cases.

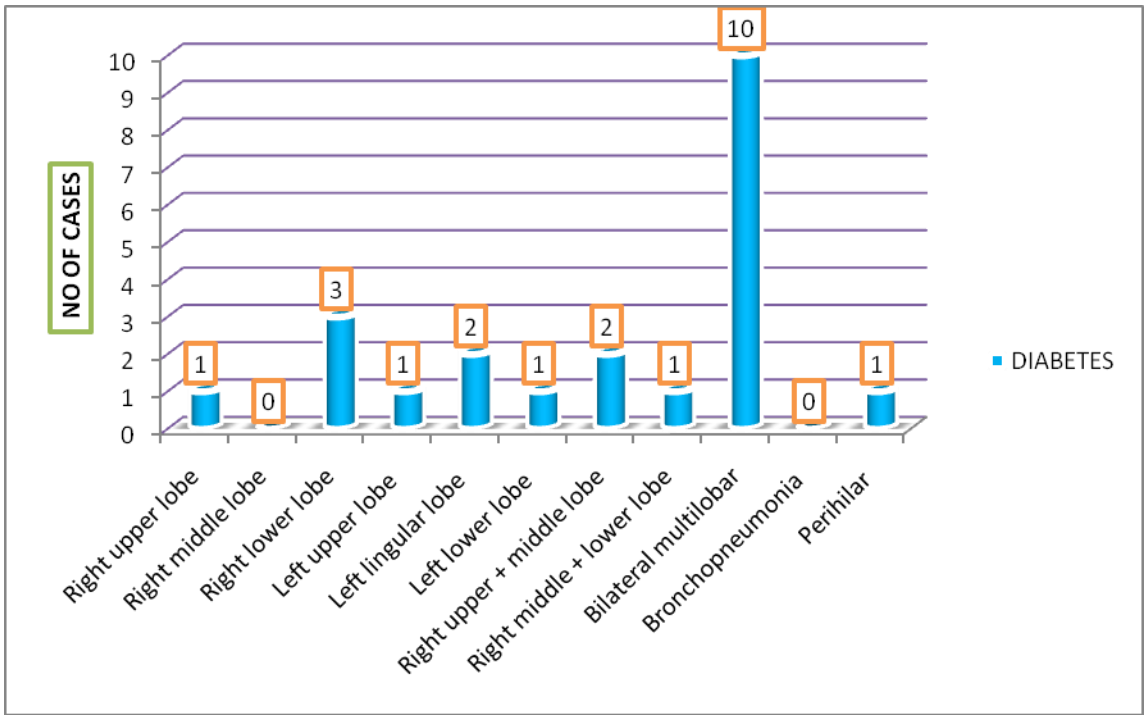

Fig 9: Diabetes and Radiological report

Among 100 pneumonic patients 22 were diabetic and 78 were non diabetic. Of them the most common pattern of radiological presentation is bilateral multilobar pattern 10 cases, followed by right lower lobe pneumonia. This has more significance than non diabetic with $p < 0.05$.

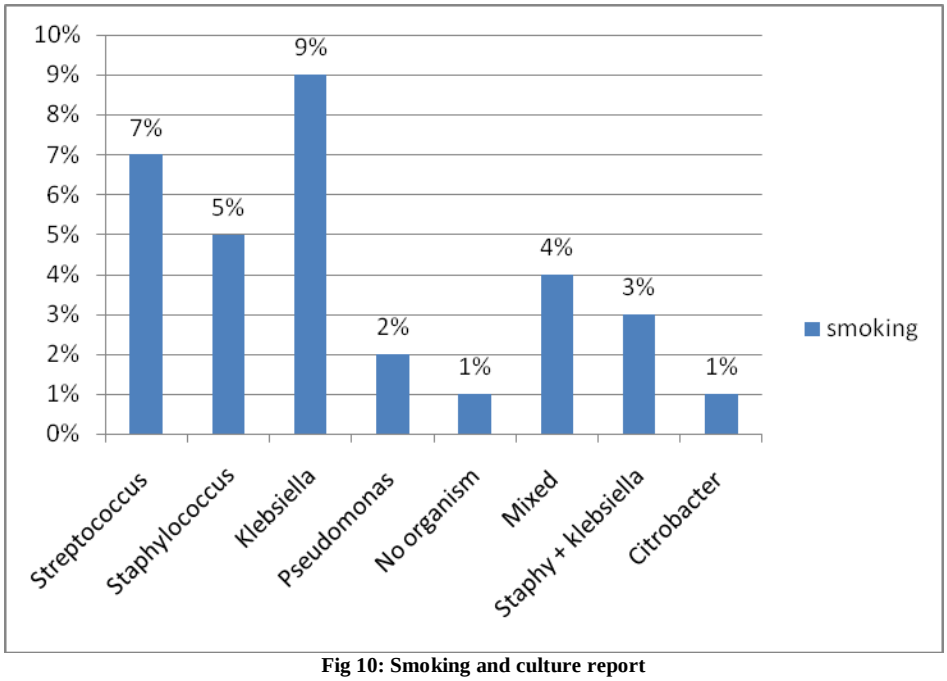

Fig 10: Smoking and culture report

Among 32 patients with smoking and pneumonia compared with non smokers the most common organism isolated was klebsiella (9%) with significance (p=0.003) followed by streptococcus (7%), staphylococcus (5%), mixed organism (4%).

Radiological report

Patients with pneumonia are diagnosed radiologically by chest x ray PA view, lateral view and chest CT scan into predominant involvement of lung parenchyma. hence divided into specific lobar involvement.

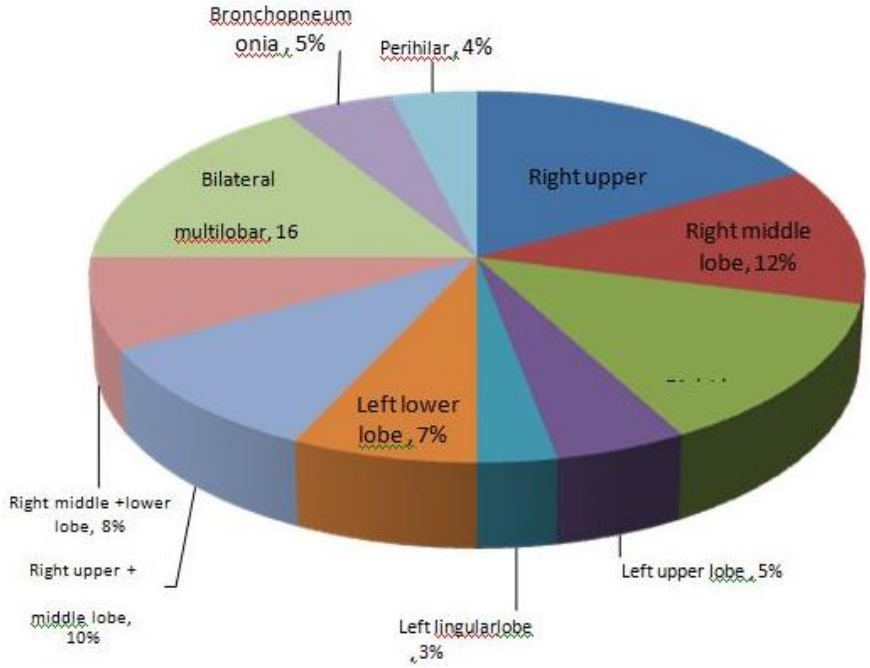

Fig 11 : Radiological report

Table 3 : Radiological report of this study

Radiological report	Percentage
Right upper lobe	17%
Right middle lobe	12%
Right lower lobe	13%
Left upper lobe	5%
Left lingular lobe	3%
Left lower lobe	7%
Right upper + middle lobe	10%
Right middle + lower lobe	8%
Bilateral multilobar	16%
Bronchopneumonia	5%
Perihilar	4%

Out of 100 patients radiologically proven as pneumonia, predominantly right upper lobe is seen in17%, followed by bilateral multilobar (16%), right lower lobe (13%), right middle lobe (12%), right upper + middle lobe (10%), right middle + lower lobe (8%), left lower lobe (7%), bronchopneumonia and left upper lobe each of 5%, perihilar (4%), left lingular lobe (3%).

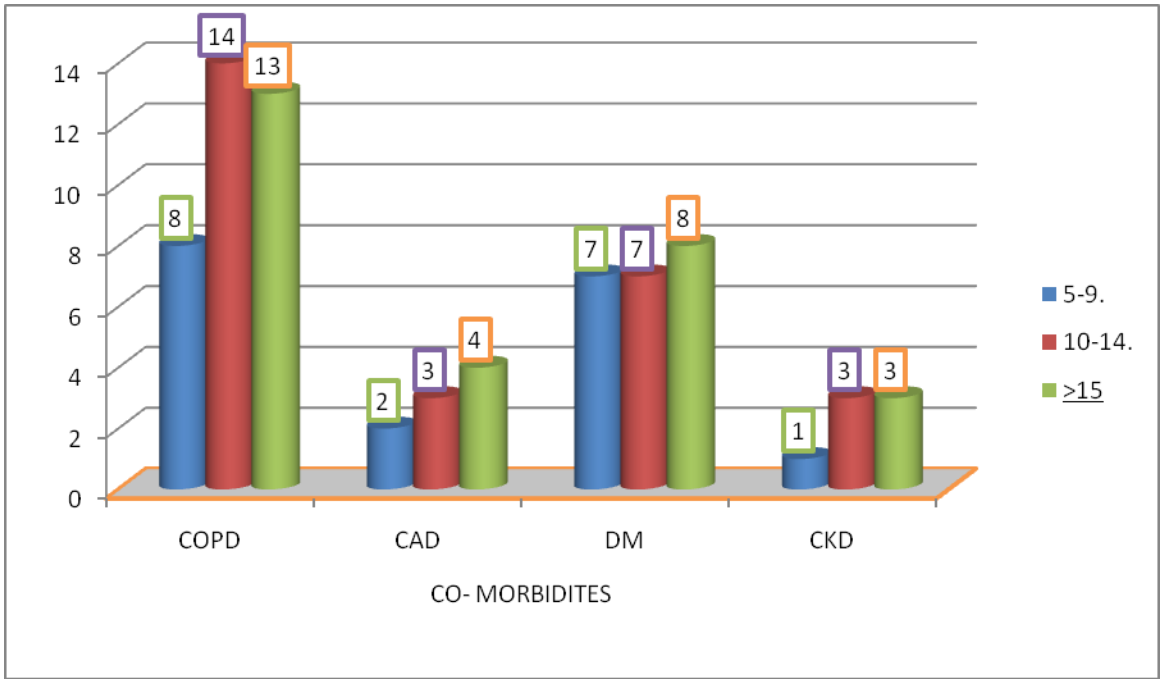

Fig 12: Comorbidties and hospital stay

Table 4 : Co morbidities and duration of hospital stay

COMORBIDITIES	DURATION OF HOSPITAL STAY (no. of cases)		
	5-9 days	10-14 days	≥15 days
COPD	08	14	13
CAD	02	03	04
DM	07	07	08
CKD	01	03	03

Among 100 patients of pneumonia with comorbidities COPD patients wereseen to have longer duration of hospital stay of ≥15days ($p<0.001$).

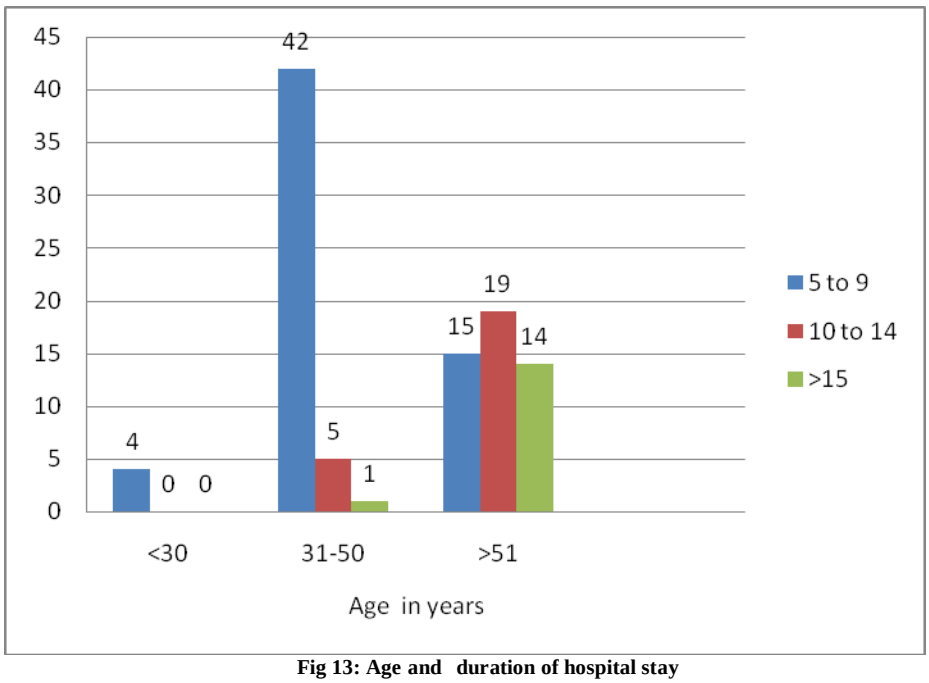

Fig 13: Age and duration of hospital stay

Table 5 : Age and duration of hospital stay in this study

AGE in years	DURATION OF HOSPITAL STAY in day			
	5 – 9	10 – 14	≥15	Total
< 30	04 (4%)	0%	0%	4%
31 – 50	42(42%)	05(5%)	01 (1%)	48%
>51	15(15%)	19(19%)	14(14%)	48%
Total	61(61%)	24(24%)	15(15%)	100%

Of total 100 patients admitted in hospital for pneumonia, 61% were in the duration of 5-9 days, 24%were in the duration period of 10-14 days, and 15% were in the hospital for >15 days. Increased duration of hospital stay(≥15 days) is seen in elderly patients (>51yrs) ($p < 0.001$)

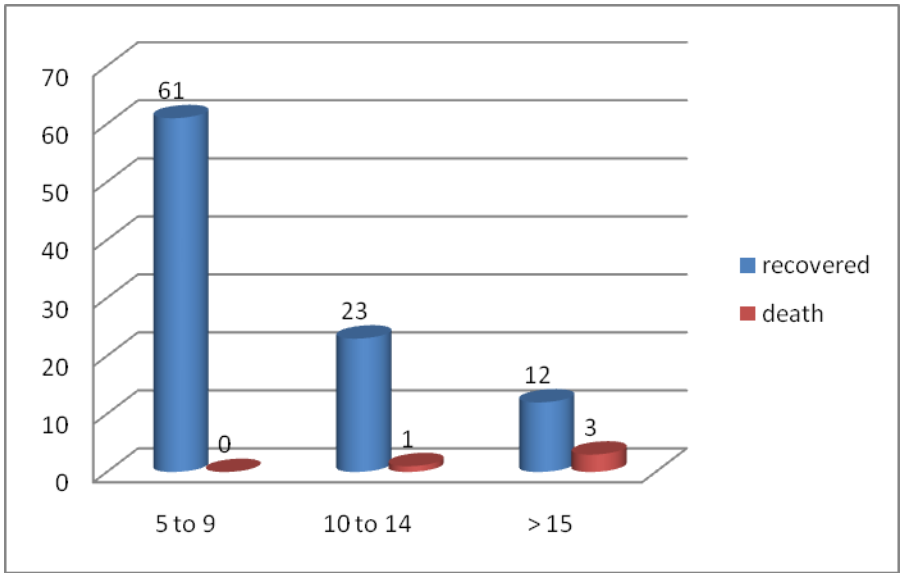

Fig 14: Duration of Hospital stay and outcome

Out of 100 patients treated for pneumonia 4 (4%) died of which 3 were ofhospital duration ≥15 days, 1(1%) in the duration of 10-14 days.

Discussion

Pneumonia is a common medical problem in tropical countries like India. This study consisted of 100 patients admitted in Rangaraya Medical College and Hospital, Kakinada. All cases met inclusion and

exclusion criteria.

There are many studies done in different parts of the world on community Acquired Pneumonia and hospital acquired pneumonia. Few of the important studies are considered for comparison purpose and comparative study is discussed.

Age

In the present study 48% each were in elderly age group of >51 years and middle aged group of 31-50 yrs of the total cases. It is well documented that pneumonia is commonly occurring disease in the community & its incidence rises sharply with extremes of age[6]. In this study group patients below 18 years were not included, but majority of patients were middle aged and elderly.

Sex incidence

In this study of 100 patients it was observed that majority of patients are males 77% in comparison to the female population which was 23%. This could be attributed to the well-established fact that cigarette smoking and alcoholism, as well as underlying lung disease e.g. COPD predispose to pneumonia and are more common in developing country like India. In this study group majority of male patients are exposed to one or more of the above-mentioned predisposing factors[7,8,9].

Presenting complaints

In this study among the presenting symptoms, cough with expectoration wascommon 100%, fever 60%,dyspnoea 45%, and chest pain 13%.

Risk factors

Structural lung diseases and associated diseases e.g. Diabetes altering the local lung defense mechanisms and systemic defense mechanisms, predisposing to acute lung infection has been well-documented. In this study of 100 patients 35% had COPD, 22% had diabetes. The COPD patients had altered cellular and structural abnormalities in the lung. The change in the bacterial flora in these patients is well supported by ineffective coughing and advanced age 9 predisposes them to pneumonia· [9]. The comorbidities of this study were compared to Previous findings[10].

Sputum culture

In the present study it is found that staphylococcus aureus being more common pathogen in CAP accounting for 26%. Next common is streptococcal pneumonia, which accounts for 23%. No organism was isolated in 16%. Our studies correlated with previous findings[11,12].

Chest x ray

Chest film showing infiltrates is necessary to establish the diagnosis of pneumonia. Radiographic changes usually cannot be used to distinguish bacterial from non bacterial pneumonia, but they are often important for evaluating the severity of illness, determining the need for diagnostic studies and selecting antibiotic agent. In the present study we got chest x ray report as consolidation of right upper lobe (17%) followed by bilateral multilobar (16%) as the most common presentation, right lower lobe (13%), right middle lobe (12%), right upper and middle lobe(10%), right middle and lower lobe (8%), left lower lobe (7%), left upper lobe and bronchopneumonia each of 5%, perihilar (4%), left lingular (3%)

Previous study showed right lower lobe as most common presentation (26%), right middle lobe (18%), right upper lobe (6%), right middle and lower lobe (10%), right paracardiac (6%), left lower lobe (16%), left upper and lower lobe (14%), bilateral involvement in (4%)[13].

Fig 15: chest x ray showing right upper lobe with bulging fissure sign – Klebsiellapneumonia

Fig 16: chest x ray showing bilateral bronchopneumonia

Fig 17: chest x ray showing right lower lobe pneumonia

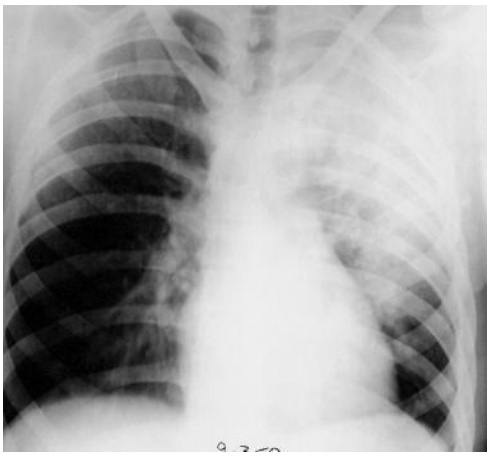

Fig 18 : chest x ray showing left upper lobe pneumonia

Fig 19: chest x ray showing right hilar consolidation

Fig 20: chest x ray showing bilateral pneumonia

Fig 21: chest x ray showing right upper, middle lobe and left lower lobe pneumonia

Fig 22: chest x ray lateral view showing right middle lobe pneumonia

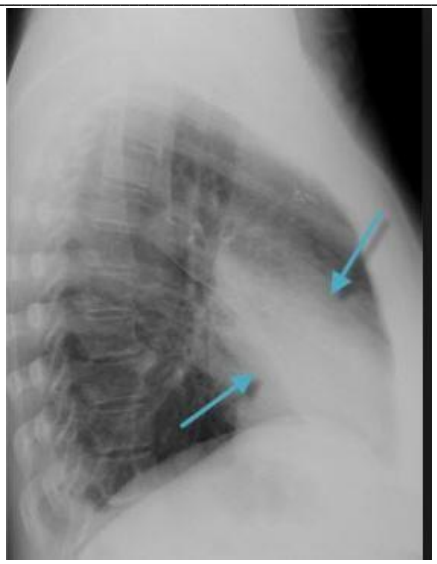

Fig 23: chest x ray lateral view showing left lingular lobe pneumonia

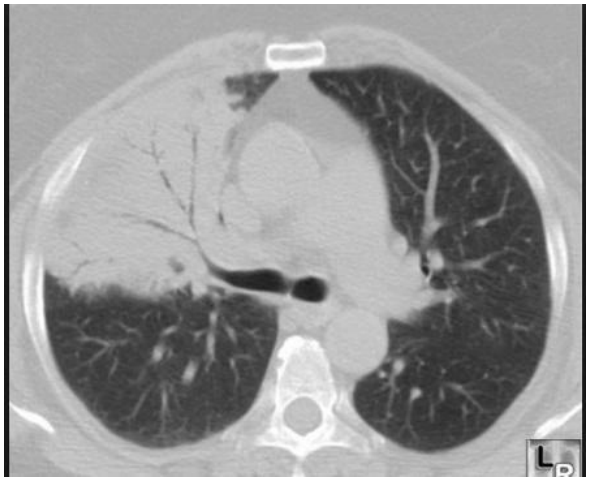

Fig 24: CT thorax showing right upper lobe consolidation

Treatment

All the patients were treated with antibiotics (oral and IV antibiotics) of their sensitivity along with supportive therapy like IV infusion, bronchodilators, analgesics, education about their illness. All the patients responded to the treatment and were discharged after confirming the resolution with chest x-ray at the time of discharge[14]. Some patients with co morbidities and elderly required ventilator support along with antibiotics (9 cases) of which 4 deaths occurred. Recommended empirical antibiotics for community acquired pneumonia[15]. Recommendations for vaccine prevention of community-acquired pneumonia.

Conclusion

All the cases of CAP admitted during this period in the medical wards were randomly selected and studied with patient consent. A detailed analysis of history, clinical examination bacteriology, radiology (CXR PA and lateral, CT) were done.

All the findings of this study were compared to similar studies done at othercentres in India and abroad and available literatures were reviewed. The age group in this study group varied from 27-80 years, most of them were between 30- 65 years, predominantly middle and elderly age accounting for 96%. The incidence of pneumonia is most common in men (77%) compared to females (23%).

- The associated diseases in this study are COPD (35%) & DM (22.0%).
- The commonest presenting symptoms are cough (100%), expectoration (100%), fever (60%) other symptoms include dyspnoea (45%), and chestpain (13%).
- The haematological value showed leucocytosis (35%).
- The Sputum culture showed 23% streptococcal, 26% staphylococcus aureus, 9% pseudomonas, 13% Klebsiella, 16% normal comensols and7% mixed, staphylococcus and klebsiella (5%), citrobacter(1%).

Acknowledgment

The author is thankful to Superindent of General Hospital and HOD of Pulmonary Medicine, Rangaraya Medical College, Kakinada for providing all the facilities to carry out this work.

References

1. Field S. K., Fisher D., Cowie R. L. Mycobacterium avium complex pulmonary disease in patient without HIV infection. Chest. 2004;126(2):566–581.
2. Tortoli E. Impact of genotypic studies on mycobacterial taxonomy: the new mycobacteria of the 1990s. Clinical Microbiology Reviews. 2003;16(2):319–354.

3. Cassidy P. M., Hedberg K., Saulson A., McNelly E., Winthrop K. L. Nontuberculous mycobacterial disease prevalence and risk factors: a changing epidemiology. Clinical Infectious Diseases. 2009;49(12):e124–e129.
4. Maurya A. K., Nag V. L., Kant S., et al. Evaluation of an immunochromatographic test for discrimination between Mycobacterium tuberculosis complex & non tuberculous mycobacteria in clinical isolates from extra-pulmonary tuberculosis. Indian Journal of Medical Research. 2012;135(6):901–906.
5. Horsburgh C. R., Jr. Epidemiology of disease caused by nontuberculous mycobacteria. Seminars in Respiratory Infections. 1996;11(4):244–251.
6. Winthrop K. L., Abrams M., Yakrus M., et al. An outbreak of mycobacterial furunculosis associated with footbaths at a nail salon. The New England Journal of Medicine. 2002;346(18):1366–1371.
7. World Health Orgnization. The Use of Liquid Medium for Culture and Drug Susceptibility Testing (DST) in Low and Medium Income Settings: Summary of the Expert Group Meeting on the Use of liquid Culture Systems. Geneva, Switzerland: World Health Orgnization; 2007.
8. Lee A. S., Jelfs P., Sintchenko V., Gilbert G. L. Identification of non-tuberculous mycobacteria: utility of the GenoType Mycobacterium CM/AS assay compared with HPLC and 16S rRNA gene sequencing. Journal of Medical Microbiology. 2009;58(7):900–904.
9. Singh A. K., Maurya A. K., Umrao J., et al. Role of genotype((R)) mycobacterium common mycobacteria/additional species assay for rapid differentiation between Mycobacterium tuberculosis complex and different species of non-tuberculous mycobacteria. Journal of Laboratory Physicians. 2013;5(2):83–89.
10. Paramasivan C. N., Govindan D., Prabhakar R., Somasundaram P. R., Subbammal S., Tripathy S. P. Species level identification of non-tuberculous mycobacteria from South Indian BCG trial area during 1981. Tubercle. 1985;66(1):9–15.
11. Myneedu V. P., Verma A. K., Bhalla M., et al. Occurrence of non-tuberculous mycobacterium in clinical samples—a potential pathogen. Indian Journal of Tuberculosis. 2013;60(2):71–76.
12. Scott C. P., Filho L. D. F., Mello F. C. D. Q., et al. Comparison of C18-carboxypropylbetaine and standard N-acetyl-L-cysteine-NaOH processing of respiratory specimens for increasing tuberculosis smear sensitivity in Brazil. Journal of Clinical Microbiology. 2002;40(9):3219–3222.
13. Carricajo A., Fonsale N., Vautrin A. C., Aubert G. Evaluation of BacT/Alert 3D liquid culture system for recovery of mycobacteria from clinical specimens using sodium dodecyl (Lauryl) sulfate-NaOH decontamination. Journal of Clinical Microbiology. 2001;39(10):3799–3800.
14. Ängeby K. A. K., Werngren J., Toro J. C., Hedström G., Petrini B., Hoffner S. E. Evaluation of the BacT/ALERT 3D system for recovery and drug susceptibility testing of Mycobacterium tuberculosis . Clinical Microbiology and Infection. 2003; 9(11):1148–1152.
15. Kubica G. P. Differential identification of mycobacteria. VII. Key features for identification of clinically significant mycobacteria. American Review of Respiratory Disease. 1973;107(1):9–21.

Conflict of Interest: Nil
Source of support:Nil