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A Clinical Observational Study of Different Antibiotic Regimens In Treating Community Acquired Pneumonia In A Tertiary Care Teaching Hospital

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Abstract

Introduction: Pneumonia is a lower respiratory tract infection characterized by collection of pus and other fluids in the air sacs i.e., alveoli of the lungs. Lung air sacs are structures, play a significant role in the exchange of gases such as oxygen and carbon dioxide. Collection of pus in air sacs leads to shortness of breath i.e., dyspnoea. Pneumonia is caused by bacteria such as Streptococcus pneumoniae, Mycoplasma pneumoniae, Clamidophilapneumoniae, fungus such as Legionella species and other Respiratory viruses[1]. Pneumonia is an infection of lung parenchyma classified into Community Acquired Pneumonia (CAP) and Health Care Associated Pneumonia (HCAP)[2]. The increased incidence of CAP with increasing patient age ; the annual incidence of pneumonia in the USA was 24.8 cases per 10,000 adults ,with the highest rates among adults aged, between 65 and 79 years of age (63.0 cases per 10,000 adults) and those aged 80 years or older (164.3cases per 10,000 adults)[3].The most common symptoms include cough that produces sputum, fever, shortness of breath, headache[4]. Classic pneumonia is caused due to *streptococcus pneumonia*, in this, lobar patterns are present, evolves through four phases and is characterized by changes in the alveoli: stage of congestion, stage of red hepatization, stage of grey hepatization, stage of resolution[5]. For pneumonia diagnosis patients detail history of sign & symptoms, chest x-rays, sputum test, culture sensitivity test are useful[6].

According to **Infectious Disease Society of America [IDSA] and American Thoracic Society [ATS],** Initial therapy is usually empirical that is designed to treat CAP caused due to various pathogens. In CAP cases, antibiotic therapy should begin at the earliest[7].

TableNo.1.1: Empirical Antibiotic Treatment Of Community-Acquired Pneumonia

[a]Doxycycline (100 mg PO bid) is an alternative to the macrolide.

[b]MICs of > 16 µg/ml in 25% of isolates.

[c]A respiratory fluoroquinolone should be used for pencilin-allergic patients.

[d]Doxycycline (100 mg IV q12h) is an alternative to the macrolide.

[e]For pencillin-allergic patients, use a respiratory fluoroquinolone and aztreonam (2 g IV q8h).

[f]For pencilllin-allergic patients, substitute aztreonam.

Abbreviations: CA-MRSA, Community – acquires methicillin - resistant staphylococcus aurous, ICU, intensive care unit.

Aim of The Study

To study the Empirical treatment of antibiotic drug regimens in patients with Community Acquired Pneumonia (CAP) in a tertiary care teaching hospital.

Materials & Methods

Study Design: A Hospital Based Prospective Observational Study was carried.

Sample Size: 120 Patients

Study Duration: About 6 months i.e., from June 2018 to December 2018**.**

Study Criteria:

Inclusion criteria:

- Patient who are willing to participate in the study.
- Both male and female patients (IP patients) who were diagnosed as community Acquired Pneumonia (CAP) and prescribed with antibiotic drug regimen.
- Patients with co-morbid pathological conditions also included.
- Exclusion criteria:
- Patients who are not willing to participate in the study.
- Neonates and pediatric patients are excluded.
- Pregnant women are excluded.
- Out patients & Patients admitted for surgical procedures also excluded.

Source Of Data

All necessary and relevant information was collected on designed patient data collection form (Annexure-I) which contains demographic details, provisional diagnosis, confirmatory diagnosis, radiographic data, social habitats, isolated organism, sensitivity & resistance to various antibiotics, treatment before culture report & after culture report of specimens of patients with CAP in IP general medicine department.

Materials

1. **Patient data collection form (Annexure-I):** A well-structured patient data collection sheet was prepared and in which patient details will be recorded.
2. **Patient informed consent document (Annexure-II):** The details of the patient and laboratory parameters were collected after inform consent taken from the patient.
3. **Patient information leaf let (Annexure –III) Method Of Study:**This study was performed to determine the randomized study of different antibiotic regimens in general medicine ward admitted patients with clinical diagnosis as Community Acquired Pneumonia (CAP). All the prescriptions containing antibiotic drug regimens were monitored and documented to know the frequency and extent to which antibiotics were indicated. The study protocol was designed on the basis of necessity of study and was explained to the Institutional Ethical Committee (IEC). An approval was procured to carry out the study as per the designed protocol. Literatures regarding randomized study of different antibiotic regimens in treating Community Acquired Pneumonia patients were reviewed for a period of 40 to 45 days to start research work. During ward rounds, entire patient's data was collected with special reference to Community Acquired Pneumonia cases in which antibiotic drug regimen was prescribed. Whole data was documented in proper format.

Study Approval

Permission for collecting patient's data was approved from Superintendent of RIMS hospital and Clinical guide of General medicine department. In addition, we also request Hospital management to permit to utilize the facilities for regular follow ups of prescriptions for undergoing a smooth and sophisticated research work.

Statistical Analysis

Results were represented as frequencies, percentages, mean and medians. Percentage method was used for analyzing the data. Graph pad prism software was applied to analyze the data. In some cases, inferential statistics like Analysis of variance (ANOVA) followed by student t-test, (at 95% confidence interval and $P<0.05$ considered as significant) using SPSS 21.0 software.

Ethical Considerations

One of the major characteristics of modern society is a pronounced interest in ethical questions. Medicine, especially research on humans, is at the top of the list. The

Helsinki Declaration which was established in 1964 (Sixth revision in 2000) is considered as the gold standard for research ethics to provide a universal set of principles and to direct the ethical conduct of medical research. The first principle of ICH (taken from WHO GCP in 1995) states: "Clinical studies should be conducted in accordance with the ethical principles that should be consistent with Good Clinical Practice (GCP) and regulatory requirements". The most important ethical aspect of the clinical study is Informed Consent Document (ICD). The international covenant accepted by United Nations Assembly in 1966 stresses that "no one shall be subjected without his free consent to medical or scientific experimentation".

Results

The prospective observational study was conducted for a period of 6 months i.e., from June 2018 to December 2018 in South Indian Tertiary care teaching Hospital RIMS, Kadapa. A total of 120 patients were recruited under inclusion criteria after taking informed consent form (ICF) from patients.

1. Patient Distribution Based On Gender: Out of 120 patients, 77 were males constituted for 64.17% and 43 were females constituted for 35.83%. In our analysis, we found that community acquired pneumonia is more common in Males when compared to Females.

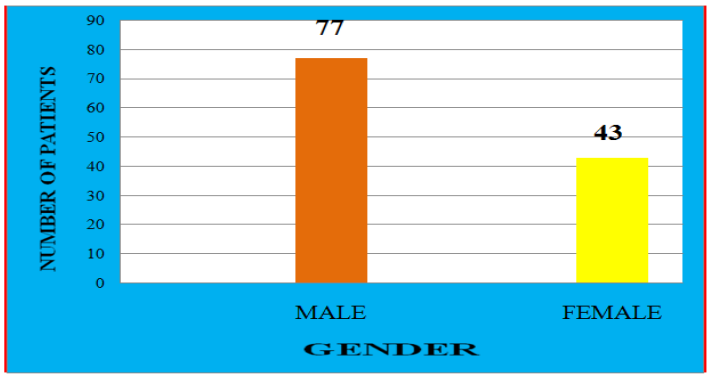

Fig.No.1.1: Graphical Representation of Male Patients & Female Patients

2. Patient Distribution Based On Different Age Groups: A total of 120 patient case sheets diagnosed with Community Acquired Pneumonia were collected and divided into 5 different age groups. 12 patients were in 16-25 years age group constituted for 10%, 16 patients were in 26-35 years age group constituted for 13.33%, 23 patients were in 36-45 years age group constituted for 19.17%, 38 patients were in 46-55 years age group constituted for 31.67% and 31 patients were in 56 and above years age group constituted for 25.83%

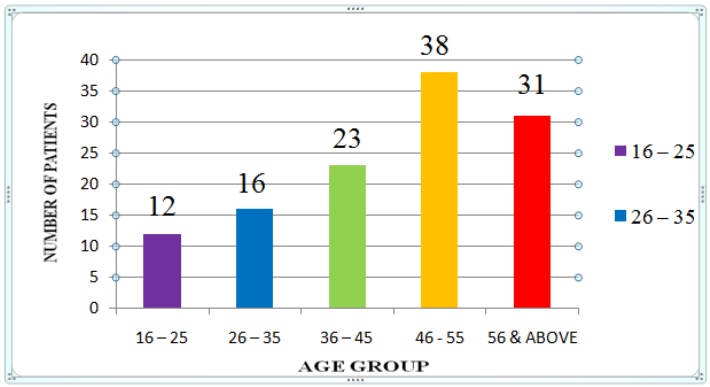

Fig.No.2.1: Graphical Representation of Different Age Groups Patients

Patient Distributions Based On Detailed Types of Co-Morbidities: In a total of 120 patients, 58 patients had co-morbid conditions of which 17 patients had co-morbidities with COPD constituted 29.31%, for 6 patients had co-morbidities with asthma constituted for10.34%,12 patients had co-morbidities with hypertension constituted for 20.69%, 14 patients had co-morbidities with T2D.M constituted for 24.14%,4 patients had co-morbidities with hypothyroidism constituted for 6.90%, 2 patients had co-morbidities with epilepsy constituted for 3.45%, 3 patients had co-morbidities with IHD constituted for 5.17%.

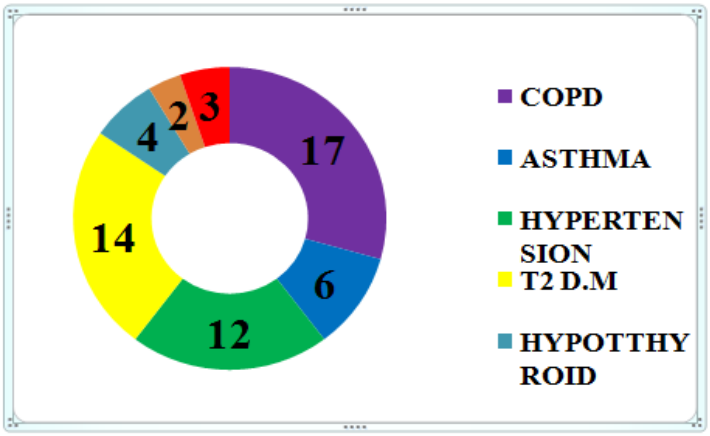

Fig.No.3.1: Circular Representation of Patients with Detailed Co-morbidities.

4. Patient Distribution Based On Detailed Social Habits: A total of 120 subjects were selected for our research study in which 84 patients had social habits and 36 patients did not have any of social habits. Out of 84 subjects, 35 patients had a habit of Smoking constituted for 29.16%, 12 patients were Alcoholics constituted for 10.00%, 17 patientswere Beetle nut chewers constituted for 14.16% and 20 patients had a habit of both Smoking and Alcoholism constituted for 16.66%

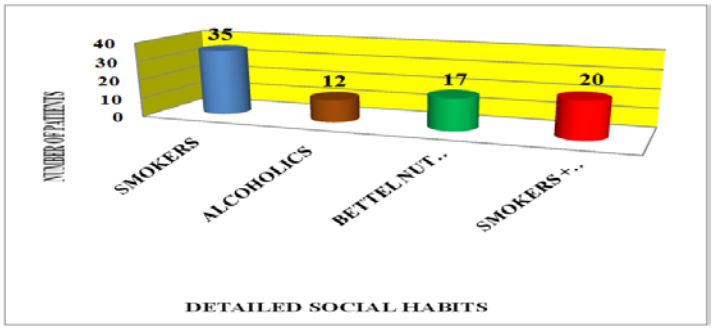

Fig.No.4.1: Graphical representation of Patients with Detailed Social Habits

5. Patient Distribution Based On Radiological Findings: In our research study, 120 patients who were recruited according to inclusion criteria have undergone radiological examinations such as chest X-ray &CT chestand foundthat 105 patients had Single-Lobe Infiltration constituted for 87.50% and remaining 15 patients had Multi-Lobe Infiltration constituted for 12.50%

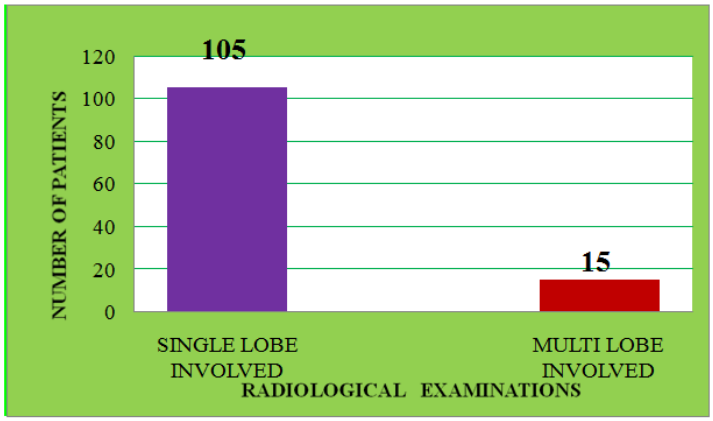

Fig.No.5.1: Graphical Representation of Single –Lobe & Multi – Lobe Infiltrations

6. Patients Distribution Based On Sputum Culture Test: In a total of 120 patients, 65 patients had undergone sputum culture test constituted for 54.17% and remaining 55 patients did not undergo sputum culture testsconstituted for 45.83%.

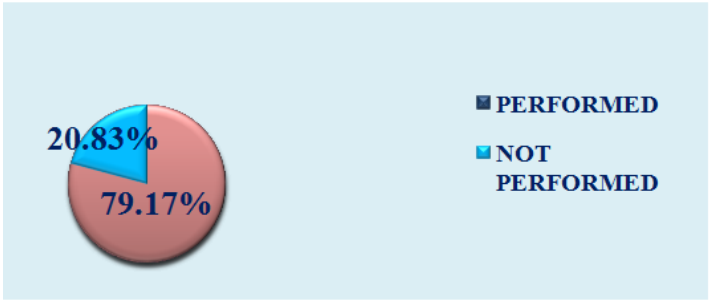

Fig. No6.1: Percentages of Patients with respect to Sputum Culture Test

7. Patient Distribution Based On Types Of Bacteria: In a total of 68 samples, it was found that Streptococcus pneumoniae was isolated in 23 patients constituted for 33.82%, pseudomons aeruginosa was isolated in 19 patients constituted for 27.94%, klebsiella pneumoniae was isolated in 11 patients constituted for 16.18% Escherichia coliwas isolated in 7 patients constituted for 10.29%, Streptococcus aureus was isolated in 6 patients constituted for 8.82%and hemophilus Influenzae was isolated in 2 patients constituted for 2.95%.

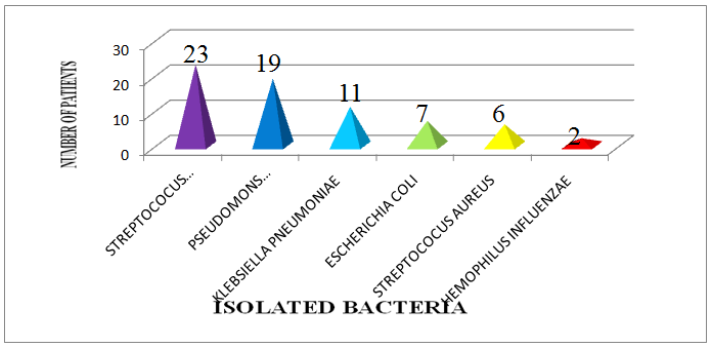

Fig.No.7.1: Graphical Representation of Patients Based on Types of Bacteria

8. Patient Distribution Based On Antibiotic Regimen: In a total of 120 patients, 33 patients were prescribed with Ceftriaxone + Augmentin constituted for 27.5%, 29 patients were prescribed with Ceftriaxone + Azithromycin constituted for 24.18%, 7 patients were levofloxacin prescribed with constituted for 5.83%, 25 patients were prescribed with Ceftriaxone + Levofloxacillin constituted for 20.83%, 10 patients were prescribed with Ceftriaxone + Ciprofloxacillin constituted for 8.33% and 16 patients were prescribed with Ceftriaxone + Augmentin + Azithromycin constitutedfor 13.33%.

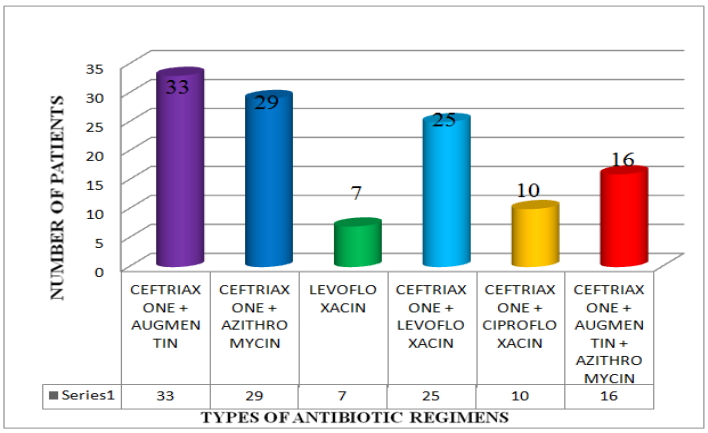

Fig.No.8.1: Graphical representation of Patients based on Antibiotic Regimen

9. Patient Distribution Based On Type Of Empirical Therapy: In a total of 120 patients, 7 patients received Mono antibiotic therapy constituted for 87.50% 97 patients received Dual antibiotic regimen constituted for 87.50% and 16 patients treated with Triple antibiotic regimen constituted for 12.50%.

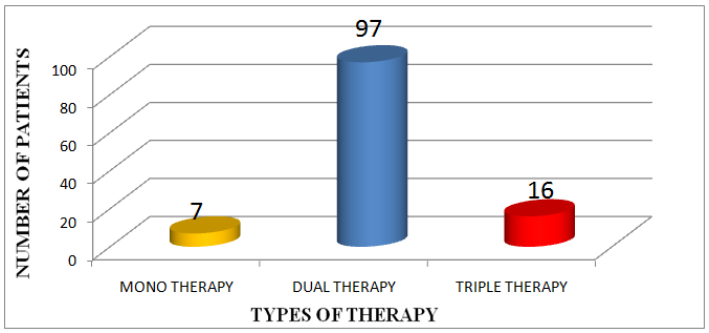

Fig.No9.1: Graphical representation of Type of Empirical Therapy

10. Patient Distribution Based On Length Of Hospital Stay: It is a time period that exists between Date of Admission (DOA) into the hospital and Date of Discharge (DOD) from the hospital. The minimum duration of Hospitalization was 3 days and maximum duration was 14 days. Of 120 patients, 55 patients had 3-5 days of Hospital stay, 45 patients had 6-8 days of Hospital stay, 8 patients had 9-11 days of Hospital stay and 12 patients had 12-14 days of Hospital stay.

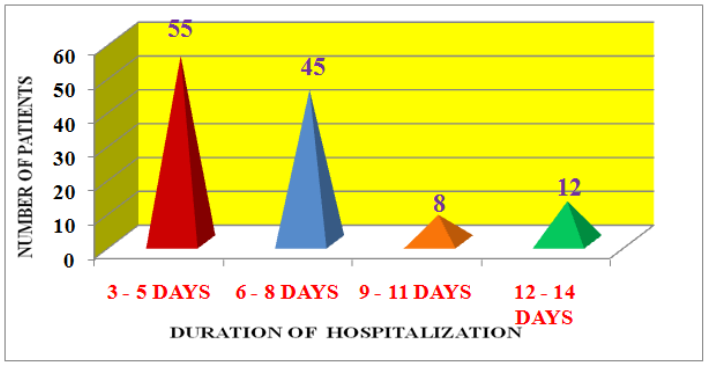

Fig.No.10.1: Graphical representation of Patients based on Hospital Stay

Discussion:

- At first, we started with simple parameter i.e., patient's gender. Males(64.17%)are being more affected with CAP than females(36.83%) and literature like Mustafa S. Saeed et al., [8] Siddalingappa CM et al., [9] has got same results. Coming to the age parameter the patient with age group of 46-55 years are more affected i.e.,

31.67% and 31 patients were in 56 and above years age group constituted for 25.83% than the patients with other aged group, but literature of Kumar S et al., [10] has concluded that 65 – 75 years age group patients are more affected with CAP. The patients with<18.5 Body Mass Index are highly affected with CAP.

- We found that patient with co-morbidities are highly susceptible to CAP than normal individuals and the patients with respiratory tract co-morbidities are high prone to CAP In a total of 120 patients, 58 patients had co-morbid conditions of which 17 patients had co-morbidities with COPD constituted 29.31%, for 6 patients had co-morbidities with asthma constituted for10.34%,12 patients had co-morbidities with hypertension constituted for 20.69%, 14 patients had co-morbidities with T2D.M constituted for 24.14%,4 patients had co-morbidities with hypothyroidism constituted for 6.90%, 2 patients had co-morbidities with epilepsy constituted for 3.45%, 3 patients had co-morbidities with IHD constituted for 5.17%. that is supported by Kumar S et al., [10] literature. We also analyzed social habitats of patients, found that habituated patients were more affected with CAP than non-habituated patient and patients with smoking habit have higher incidence rates of occurring CAP.
- In our research study, 120 patients who were recruited according to inclusion criteria have undergone radiological examinations such as chest X-ray & CT chest and found that 105 patients had Single-Lobe Infiltration constituted for 87.50% and remaining 15 patients had Multi-Lobe Infiltration constituted for 12.50%, this result is supported by literatures Mustafa S. Saeed et al., [8] Ayesha Fatima A et al., [11] 95 patients had undergone sputum culture test and remaining 25 patients did not undergo sputum culture tests Out Of 95 subjects, Bacteria was isolated in 68 patients, Fungus was isolated in 21 patients and Virus was isolated in 6 patients, coincided with Taura DW et al.,[12] and Ramana KV et al. [13]literatures. In a total of 68 samples, it was found that Streptococcus pneumoniae was isolated in 23 patients constituted for 33.82%, pseudomons aeruginosa was isolated in 19 patients constituted for 27.94%, klebsiella pneumoniae was isolated in 11 patients constituted for 16.18% Escherichia coli was isolated in 7 patients constituted for 10.29%, Streptococcus aureus was isolated in 6 patients constituted for 8.82%and hemophilus Influenzae was isolated in 2 patients constituted for 2.95% and compared with Taura DW et al., [12], Ramana KV et al. [13]and Zafar A et al, [14]literatures got the same results.
- In a total of 120 patients, 33 patients were prescribed with Ceftriaxone + Augmentin constituted for 27.5%, 29 patients were prescribed with Ceftriaxone + Azithromycin constituted for 24.18%, 7 patients were levofloxacin prescribed with constituted for 5.83%, 25 patients were prescribed with Ceftriaxone + Levofloxacillin constituted for 20.83%, 10 patients were prescribed with Ceftriaxone + Ciprofloxacillin constituted for 8.33% and 16 patients were prescribed with Ceftriaxone + Augmentin + Azithromycin constituted for 13.33%. Literature like Meng Tse.,[15] had connived that β-lactam alone was the most common antibiotic regimen prescribed for patients and give support to our study. Literatures of Okesola AO et al., [16] , Li JZ et al.,[17] gave the evidence that matches to our study.
- In a total of 120 patients, 7 patients received Mono antibiotic therapy constituted for 87.50% 97 patients received Dual antibiotic regimen constituted for 87.50% and 16 patients treated with Triple antibiotic regimen constituted for 12.50% found the same pattern

of results in literature of Meng Tse, Gabriel Lee et al., [15] and Taura DW et al., [12]. Length of hospital stay is defined as time period that exists between Date of Admission (DOA) into the hospital and Date of Discharge (DOD) from the hospital. In our study, minimum duration of Hospitalization for CAP patients was 3 days and maximum duration was 14 days. In a total of 120 patients, 55 patients had 3-5 days of Hospital stay, 45 patients had 6-8 days of Hospital stay, 8 patients had 9-11 days of Hospital stay and 12 patients had 12-14 days of Hospital stay and same conclusion was given Mustafa S. Saeed et al., [8] ,Kumar S et al.,[10] literature. This clearly indicates that the symptoms will be free with in less time in case of Pneumonia.

Conclusion

This research work clearly highlights the study of Empirical treatment of antibiotic drug regimens in patients with Community Acquired Pneumonia (CAP) in a tertiary care teaching hospital.

Male patients had higher incidence rates of occurring CAP when compared to Female patients. Maximum number of patients who were diagnosed with CAP belongs to 45 – 55 years and above age group. Patients with Social habits like Smoking, Alcoholism, Betel nut chewing have increased risk of occurring CAP when compared to patients without social habits. The risk of developing CAP was high in patients with co-morbidities like COPD, Asthma, Type 2 Diabetes Mellitus and Hypertension. Empirical treatment with Beta lactam antibiotics was the most commonly prescribed class to CAP patients, In addition, Ceftriaxone + Augmentin regimen was highly prescribed. Streptococcus pneumoniae and Pseudomonas Aeruginosa were the most common causative micro-organisms for CAP. In patients with Atypical Pneumonia, Triple antibiotic regimen was preferred over Dual therapy; also have higher Duration of Hospitalizations.

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