INTERNATIONAL JOURNAL OF SCIENCE AND NATURE

www.scienceandnature.org

STUDY OF CLINICAL AND BACTERIOLOGICAL PROFILE OF COMMUNITY ACQUIRED PNEUMONIA (CAP) AND IT'S COMPLICATIONS

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ABSTRACT
Patients (n=100) was selected based on inclusion and exclusion criteria admitted in department of pulmonary medicine, GMC, Sir. T. hospital, Bhavanagar between September 2010 and august 2011. Patient was evaluated by taking detailed history with general and detail respiratory examination findings. Followed by various laboratory investigations like CBC, RFT, LFT, RBS, Blood culture, HIV, Sputum AFB, gram stain, culture and sensitivity, CXR & USG thorax. Middle age group (age 30-50yr) was more susceptible followed by the elderly group. Males were more susceptible than females. Fever, cough, expectoration and pleuritic chest pain were relatively more common cardinal presenting clinical features and present in more than 80% of patients. Smoking and Preceding URTI were the major predisposing factors. Lower lobes were the more common sites with the right side incidence being more than the left side. Leucocytosis was seen in typical pneumonia. Sputum examination was the most feasible method to detect etiological agent. *Staphylococcus aureas* was the most common etiological agent. The response to treatment with penicillin group of drugs was only moderate (app.25%). Many patients have to be offered other group of drugs like cephalosporin, macrolides and/or quinolones for clinical response. These indicate towards growing resistance patients towards penicillin group of drugs. Most common age affected was middle age (30-50 yr). Male affected more than female. The Rt. lobe being affected more than Lt. Predisposing factors are smoking and other medical illness like DM, Renal failure etc. CXR followed by Sputum investigation contribute to diagnosis of pneumonia. Common organism responsible for CAP in present study is *Staphylococcus aureas* followed by *Pseudomonas aeruginosa*. Delayed resolution is most common complication of pneumonia followed by septicemia, collapse of lung and synpneumonic effusion.

KEY WORDS: Chest X-ray, Sputum, Smoking, Age, sex.

INTRODUCTION

Pneumonia is an infection of the lung parenchyma. Community acquired pneumonia (CAP) refer to pneumonia acquired outside of hospitals or extended care facilities. Poor socioeconomic status and overcrowding are important risk factors.CAP remains a common and serious clinical problem even with availability of potent antibiotics and vaccines. More than 5,00,000 admissions occur annually and CAP is the sixth leading cause of death in United status.[1] It is also a common problem in developing countries. in india, CAP is caused by gram negative organism, commonly. An entity called "Peripnumonia" was described by Hippocratus in the fourth century B.C.At that time treatment offered was amateur chiropody and stapler,applied to the chest to "draw away"the inflammation [2,3]. In 1934 Lannnec proved the way for our modern understanding of pneumonia by describing 3 stages of pneumonic consolidation that we know today. [3] Friendlander, between 1881 and 1884,first formed bacteria in the lungs of fatal cases of pneumonia using staining techniques of his colleague, gram and franenbed. In 1884 he isolated an organism which he called us "pnuemonicmikroccus" (modern day pneumococcus) from a 30 year old man died of pneumonia. [3] Certain epidemiological factors regarding community acquired pneumonia is the most common cause of hospital attendance. For both adults and children in developing countries and it is estimated that 5 million children under the age of 5 years die of pneumonia every year [3]. Several large studies have been conducted to study the incidence of CAP. The results of which very 10 fold, a large community study in the 60's and early 70's showed incidence rate of app.10/1000 patients population to 30/1000 patient,(for patient aged above 65 years). Most of organism are developing resistance to various antibiotics, now a day. The organism is mainly sensitive to third generation cephalosporins, fluroquinolones and aminoglycosides [4]. The problem of resistance is leading to increased morbidity and mortality by increasing duration of hospital stay, rendering our therapy ineffective and by increasing the complications. Therefore, epidemiological study for our hospital is required to study the epidemiological and clinical profile of CAP cases which will gives a lot of information and treatment guidance for improving the therapy. Present study is to study the clinical and bacteriological profile in patients of CAP in Department of Pulmonary Medicine, Sir T. General Hospital, Bhavanagar, Gujarat, India.

MATERIAL & METHOD

Prior permission for the study was taken from institutional review board, GMC, Bhavanagar, Gujarat, India. Study was carried out in department of pulmonary medicine, Govt. Medical College, sir. T. hospital, Bhavangar, Gujarat. Patients (n=100) was selected based on inclusion and exclusion criteria admitted in department of pulmonary medicine, Govt. Medical college, sir. T. hospital, Bhavangar between September 2010 and august 2011.Patient were evaluated by taking detailed history with general examination and detail respiratory examination findings. Followed by various laboratory investigations like CBC, RFT, LFT, RBS, Blood culture, HIV, Sputum AFB, Sputum's gram stain, sputum culture and sensitivity and by radiological investigations like X-ray chest PA view Lateral view and USG thorax were for laboratory investigations 11 ml blood and 5 ml sputum were collected for evaluation.

Inclusion criteria

1. Patients above the pediatric age group (age >12 yr)
2. Patients having clinical features like cough, fever, chest pain, weight loss, dysponea before admitted to hospital.
3. Radiological features of lobar consolidation.
4. Sputum culture shows bacteriological growth.
5. Patient who is willing give written informed consent.
6. Radiological evidence of TB,Pulmonary infarction,lung cancer,AIDS,CCF and leukemia.
7. Patient on immunosuppressive therapy.

Exclusion criteria:

1. Patient of pediatric age group(Age <12 yr)
2. Patients of ventilator associated pneumonia
3. Patients having hospital acquired pneumonia.
4. Pregnant women.
5. Patient who is not willing to give written informed consent.

OBSERVATION AND RESULTS:

Patients recruited in study based on inclusion and exclusion criteria admitted in department of pulmonary medicine, Govt. Medical College, sir.T. hospital, Bhavangar between September 2010 and august 2011.During these period following observations were made as shown in Table-1,2.

TABLE-1: Incidence of CAP in relation to age

Age group in years	No.of patients N=100	Percentage %
Younger age group(<20 yrs.)	12	12
Younger age group(21-30 yrs.)	16	16
Middle age group(31-40 yrs.)	19	19
Middle age group(41-50 yrs.)	18	18
Elder age group(<51-60 yrs.)	16	16
Elder age group(>60 yrs.)	19	19
Total	100	

TABLE-2: Sex incidence

Sex incidence	No. of patients N=100	Percentage%
Male	72	72
Female	28	28
Total	100	

TABLE-3: Incidence of hospitalization

Treatment	No.of patients N=100	Percentage%
Pts.Treated on OPD basis	15	15
Pts.Treated in hospital	85	85
Total	**100**	

TABLE 4: Clinical manifestation (*i.e*. Major symptoms and signs)

Major symptoms and signs	No.of patients N=100	Percentage%
1)cough	98	98
2)Pleuritic chest pain	67	67
3)Fever	93	93
4)Dysponea	52	52
5)Hemoptysis	10	10
6)Anorexia	07	07
7)Weight loss	05	05

TABLE 5: Clinical manifestation (*i.e.* signs)

clinical manifestation	No.of patients N=100	Percentage %
Resp.system		
Tachyponea(i.e R.R >25/min)	42	42
Hyperinflated chest (i.e emphysematous chest)	3	3
Dull note at affected site	45	45
Crepitations	65	65
Bronchial breath sounds etc.	40	40
CVS system		
Tachycardia(P>100/min)	45	45
e/o Hypotension/shock	15	15
GIT		
e/o organomegaly	03	03
CNS		
e/o Altered sensorium	10	10
Meningism	00	00
H/O convulsions	00	00

TABLE 6: Incidence of predisposing factors

Factor	No.of patients (N=100)	Percentage%
H/O Smoking	50	50
P/H of URTI	15	15
P/H of alcoholism	05	05
H/O TB	15	15
H/O medical condition like DM, HT, IHD. Asthma	16	16
Immunodeficiency states like HIV, Drugs, Malignancy	01	01
Total	100	

TABLE 7: Incidence of Various type of smoking

Type of smoking	No.of patients (N=50)	Percentage %
Bidi	20	40
Ciggarate	10	20
Mava	08	16
Gutakha	05	10
Tambacoo	02	04
Other	05	10
Total	50	

TABLE 8: Lobar distribution of consolidation

Lobes	No.of patients N=100	Percentage %
Rt.Lower Lobe	35	35
Rt.Middle Lobe	21	21
Rt.Upper Lobe	02	02
Lt.Upper Lobe	11	11
Lt.Lower Lobe	30	30
Bilat.Diffuse	01	01
Total	100	

TABLE 9: Profile of Laboratory Investigations

Laboratory Investigation	No.of patients N=100	Percentage %
1)Hb		
<10 gm	21	21
>10 gm	79	79
2)Total WBC count		
-With in normal limit		
(i.e 4000-10000/cmm)	29	29
-Abnormal(<4000/cmm)		
Or	01	01
10000-15000/cmm	39	39
15000-20000/cmm	19	19
>20000/cmm	12	12
3)HIV seropositivity	01	01
4)Sputum conclusive report(i.e Either gram stain and/or culture sensitivity and/or AFB)	54	54
5)Glucose intolerance i.e diabetic status	10	10

TABLE 10: contribution of various Materials for Investigations

Material for Investigation	No. of patients N=100	Percentage %
1) Sputum(as either gram stain,cytology,AFB or culture)	54	54
2) Pleural fluid(i.e routine/Micro and/or culture-sensitivity)	16	16
3) Chest X ray(PA and other views)	100	100
4) Blood culture	21	21
5) Fiber optic Bronchoscopy	14	14

TABLE-11: Microbiological agent isolated from sputum C/S.

Microbiological Agent	No.of patients N=100	Percentage%
Staphylococus(as polymicrobial flora)	21	21
Psudomonas	12	12
Klebsiella	10	10
Candida	07	07
Actinetobactor	01	01
E.coli	01	01
M.tuberculosis	02	02
No growth	46	46
Total	**100**	

TABLE 12: Microbiological agent isolated from Blood C/S.

Microbiological Agent	No.of patients N=100	Percentage %
Staphylococus(as polymicrobialflora)	06	06
Psudomonas	06	06
Klebsiella	06	06
Candida	03	03
No growth	79	79
.	**100**	

TABLE-13 Microbiological agent isolated from BAL

Microbiological Agent	No. of patients N=14	Percentage%
Staphylococus(as polymicrobialflora)	06	43
Psudomonas	04	29
Klebsiella	03	21
Candida	01	07
Total	14	

TABLE 14: Primary line of treatment

Antimicrobial Agent	No.of patients N=100	Percentage %
1) Penicillin group(includes crystalline or derivatives like Amoxicillin/ampicillin, B-lactum group)	25	25
2) Cephalosporin group	15	15
3) Macrolides(Erythromycin, Azithromycin,clarithromycin)	15	15
4) Quinolones group *i.e.* -Ciprofloxacin	17	17
5) –Levofloxacin		
6) Multiple combination drug therapy	28	28

TABLE 14: Complication

Feature	No. of patients N=100	Percentage %
1) Delayed resolution	29	29
2) Collapse(segmental or lobar)	20	20
3) Synpneumonic effusion	15	15
4) Lung abcess/empyema	00	00
5) Pneumothorax	00	00
6) Other systemic effects like shock/septicemia	20	20

TABLE 14: Mortality Complication

Factor	No of cases	Percentage
Total mortality	00	00

DISCUSSION & OBSERVATION

The following account gives a comparative study of the present study series with previous similar reported in reputed journals along with the inference of the same.

Inference: Most study series show that there is a bimodal incidence pattern with those in extreme age group (young and elder)predominantly more vulnerable to infection.This bimodal pattern can be explained by lower immunity and greater predisposing risk factors in the extremes of ages,both of which are risk factor for CAP.

TABLE 1: Age Distribution (as %)

Age Group (yr)	Surve series[5] (n=90)1992	Vali series[6] 1985	North American series(n=49)	Lancet [7]study(n=56) 1999	Finnish study series(n=50)	Present series(n=100) 2011
0-30	64.3%	59.5%	40%	25%	30%	**28%**
30-50	31.6%	29.5%	11%	15%	15%	**37%**
>50	8.8%	11%	49%	60%	55%	**55%**

TABLE 2: Sex Distribution (as %)

Sex	William[8] series (n=51)1977	Surve series[5] (n=90)1992	Lancet [7]study (n=56) 1999	White series[9] (n=52) 1981	Vali series[6] 1985	Present series (n=100) 2011
Male	70%	85%	68%	66%	62%	72%
Female	30%	15%	32%	34%	38%	28%
Ratio	2.5:1	5.4:1	2:1	2:1	2.5:1	2.5:1

Inference: All studies showed that Males were affected more than females. Present study finding matches with the previous studies.

What makes more susceptible? Probably the environmental and smoking factor play major roles as male are more exposed and smoke more which causes changes in the Respiratory tract defense mechanism with chronic scarring, URTI,& bronchitis predispose to CAP. Also alcoholism was an important risk factor.

TABLE-3: risk factor (as %)

Factor	Vali series[6] 1985	Tyagi[10] series (n=33)1981	Fakety [11]series (n=34)1981	Present series 2011
Smoking	36.2%	28%	-	50%
URTI	21%	24%	51%	15%
Alcoholism	38.2	12%	24.2%	05%
COPD/ Structural, lung disease	32.2%	20%	19.4%	08%
TB	-	08%	Nil	02%
Medical condition like DM, HT, CCF, etc.	18%	24%	-	23%
Liver compromise	04%	02%	-	03%
Immunodeficiency state like HIV etc.	6%	2%	6%	01%

Inference: The present study findings are comparable to previous studies as far as COPD/structural lung disease is concerned. Looking at the profile of predisposing factors, smoking stands first in the present series. In vali series[6] (1985)smoking was present in 36.2% of cases. In present study smoking was present in 50% of cases. This shows that habit of smoking is increases as time passes. In fakety series[11],URTI stands first as a predisposing factor. so increasing habit of smoking and more exposure to environmental pollutants have changed the incidence of pneumonia toward younger generation. Alcoholism has lower incidence in present study. This can be explained from the fact that patients studied were all from Gujarat, Where alcohol consumption is prohibited. This has a natural barring effect on the incidence of alcoholism. TB incidence was similar in Tyagi[10] (8%) and present series(2%).The incidence of Immunodeficiency stat(1% in present series) shows clear cut risk factor for various lung disease

TABLE 4: Incidence of clinical Menifestation (as %)

Symptom	William series [8]1977	Lancet study [7]1999	Vali series[6] 1985	Present series 2011
Cough	84%	80%	87.5%	98%
Pleuritic chest pain	66%	NA	NA	67%
Fever	100%	72%	100%	93%
Expectoration	20%	30%	24%	52%
Prostration and bodyache	27%	24%	NA	10%
Dysponea	02%	02%	03%	07%
Hemoptysis	03%	05%	02%	05%

Inference: Looking at the incidence of various clinical sign and symptoms it is clear that those which are the most common ones and occur with maximum frequency are the ones which are matching with the previous studies. e.g Fever occurred at a rate of 93% in the present study which is quite comparable with the previous studies. Similarly incidence of cough in present study is quite comparable with the previous studies. From above pattern of incidence it can inferred that more commoner clinical manifestations like fever, cough, pleuritic chest pain etc. tend to occur at more or less similar rates and therefore should be regard as more sensitive and even specific for diagnosis of CAP when compare to subtle clinical manifestation like prostration, bodyache, and even hemoptysis.

TABLE 5: Lobe wise distribution (as %)

Lobes	William [8]series 1977	Allen[12] (n=55) Series 1985	Vali series[6] 1985	Lancet[7] Study 1999	Present Series 2011
Rt.upper Lobe	30%	5.2%	05%	02%	02%
Rt.Middle Lobe	18.6%	10.2%	15.3%	-	21%
Rt.lower Lobe	30%	37%	32%	46%	35%
Lt.Upper Lobe	2.9%	5.6%	11.7%	02%	11%
Lt.Lower Lobe	34.5%	43%	36%	44%	30%
Bilat.Diffuse	-	-	-	06%	01%

Inference: Clearly both lower lobes are affected but Rt lower lobe is more affected than Lt lower lobe. This can be explained by factors like gravitational force that drains the infected material towards lower lobe and Rt lower lobe is directly in the line of trachea while Lt has an angulation.

TABLE-6: Contribution of Varius material for isolation and /or identification of underlying aetiological agent (as %)

Material for Investigation	Vali series[6] 1985	Lancet study[7] 1999	White series[8] 1981	Present Series 2011
1) Sputum(as either gram stain,cytology,AFB or culture)	66.6%	NA	84%	54%
2) Pleural fluid(i.e routine/Micro and/or culture-sensitivity)	36%	NA	NA	16%
3) Chest X ray(PA and other views)	100%	NA	100%	100%
4) Blood culture(if ibdicated)	02%	NA	06%	21%
5) Others(bronchoscopic aspiration fluid i.e BAL etc)	08%	NA	NA	14%

Inference: Clearly radiography and sputum investigation dominates the clinical studies.

Usefulness of sputum culture is limited by the delay usually at least 24hr, between submission of specimen and receipt of a result. Culture also suffers from the same potential problem of contamination by oropharyngeal flora as does microscopy. Further pathogen that was identified on the gram stain may not grow in culture because of the prior use of antibiotics, which clearly reduces the sensitivity of culture techniques. The diagnostic threshold for pneumonia, rather than airway colonization, has been reported as 10 CFU/ML (colony forming unit/ml)in respiratory secretion obtained by PSB, which yields only 0.01-0.0001 ml secretion. On the other hand BAL subtends a wide area of tissue and lung secretions are diluted between 10 and 100 fold, sothat when interpreting result a threshold of 10^4 or 10^5 CFU/ML may be taken. Thus Bronchoscopy can provide clues in the difficult case when other methods have failed, even when the picture has been clouded by the almost inevitable prior use of antibiotics. Negative results have to be treated with caution in patients already receiving antimicrobial therapy, since they may indicate either that the antibiotics were appropriate and that the organism have been suppressed or that there was no infection in first place and that the infiltrate was due to non infective cause, as may be so in over 40% of case.

TABLE 7: Incidence of laboratory profile(as %)

Investigation	William series[8] 1977	Lancet study[7] 1999	Vali series[6] 1985	Present study 2011
1)Hb				
<10 gm	NA	NA	16%	21%
>10 gm	NA	NA	84%	79%
2)Total WBC count				
a.With in normal limit (i.e 4000-10000/cmm)	16%	30%	NA	29%
b.Abnormal(<4000/cmm) Or 10000-15000/cmm 15000-20000/cmm >20000/cmm	84%	70%	NA	71%
3)ESR>30/1st MM or <30/1st MM	42% 58%	64% 36%	NA NA	25%
4)Abnormal RFT i.e Blood urea>60 mg/dl S.cretinine>2 mg/dl	8%	6%	NA	05%
5)Glucose intolerance i.e diabetic status	2%	10%	NA	10%
6)HIV seropositivity	NA	12%	NA	01%

Inference: From the above comparative discussion of laboratory profile, it is conclude that factors like leucocytosis and abnormal ESR values are most consistently similar and comparative in all studies.

TABLE 8: Incidence of micribiological agent isolated from sputum culture and senstivity(as %)

Microbiological Agent	Shah and singh study[13] 2008	Present study 2011
Staphylococus(as polymicrobialflora)	6%	21%
Psudomonas	9%	12%
Klebsiella	3%	10%
Candida	00%	07%
Actinobactor	1%	1%
E.coli	5%	1%
M.tuberculosis	NA	2%

Inference: In present study most common organism isolated is *staph. aureas* followed by Psudomonas, Klebessela, candida comparable to Shah and Singh study. Most of the patient from whom gram negative bacteria was isolated were over 50 yr of age ,smokers or had COPD. It has been reported that old age, smoking and COPD impair pulmonary defenses and predispose to CAP caused by gram negative bacteria. The high incidence of staphylococcus in CAP is explained by spread of staphylococcal from hospital setting to community and staphylococcus complicating virus illness esp. influenza.
In present study Mycotuberculosis tuberculosis AFB is isolated in 2% of patient as Compare to the shah and singh study.AFB has been identified in 5% case presenting case acute pneumonia in india. It can only be explained by frequent use of fluroquinolones as initial empirical antibiotic therapy.

TABLE 9: Incidence of micribiological agent isolated from BAL fluid and senstivity(as %)

Microbiological Agent	Shah and singh study[13] 2008	Present study 2011
Staphylococus(as polymicrobialflora)	30%	43%
Psudomonas	40%	29%
Klebsiella	20%	21%
Candida	10%	07%

Inference: In present study most common organism isolated from BAL fluid C/S is staphylococcus followed by pseudomonas ,Klebsiella and candida as compare to shah and singh study,in which pseudomonas is isolated most common organism.
The diagnostic threshold for pneumonia, rather than airway colonization, has been reported as 10 CFU/ML(colony forming unit/ml)in respiratory secretion obtained by PSB, which yields only 0.01-0.0001 ml secretion. On the other hand BAL subtends a wide area of tissue and lung secretions are diluted between 10 and 100 fold, so that when interpreting result a threshold of 10^4 or 10^5 CFU/ML may be taken.Thus Bronchoscopy can provide clues in the difficult case when other methods have failed, even when the picture has been clouded by the almost inevitable prior use of antibiotics.

TABLE 10: Incidence of antimicribiological agent (as %)

Antimicrobial Agent	Shah & singh study[13] 2008	Present study 2011
1) Penicillin group(includes crystalline or derivatives like Amoxycillin/ampicillin B-lactum group)	20%	25%
2) Cephalosporin group	10%	15%
3) Macrolides(Erythromycin, Azithromycin,clarithromycin)	12%	15%
4) Quinolones group i.e -Ciprofloxacin –Levofloxacin	18%	17%
5) Multiple combination drug therapy	40%	28%

Inference: In present study combination therapy used as initial treatment in CAP patient in 28% followed by penicillin in 25%,then quinolones in 17% and macrolide 15% and cephalosporin 15% compare to shah and Singh study 40%,20%,18%,10% and 12% respectively.

- A key concept in selection of empirical therapy is to inquire about antibiotic therapy in the past 3 month and select the agent that has not been used in that time period.
- If Macrolides has been used in this time period, then 35% of pneumonia isolate are resistant to a macrolide therapy compare with 7% if the patient did not have macrolide therapy in this time period. For penicillin OR a cephalosporin, resistance increases from 5 to 9% in this setting.
- Gram negative organism like pseudomonas and klebesiella are common cause of CAP in eldely and debilated person.In which combination therapy with penicillin and Macrolide and Quinolones started as empirical therapy.
- Staph.Aureas is associated with sever CAP so combination therapy with intravenous macrolide and B-lactum antibiotic used as initial treatment.
- The choice of macrolide is based on the possibility that the pneumonia might be caused by mycoplasma pneumonia,Chlamydia psittaci and coxiella burnetti are also covered by macrolide.
- First choice is based on the probability of the infection being caused by strep.pneumonia for which benzyl penicillin is the most effective antibiotic.
- If patient is allergic to penicillin, then use second generation cephalosporin.

TABLE 11: Incidence of complications (as %)

Features	Vali series[6] 1985	Present study 2011
1) Delayed resolution	38%	29%
2) Collapse(segmental or lobar)	6%	20%
3) Synpneumonic effusion	12%	15%
4) Lung abcess/empyema	19%	00%
5) Pneumothorax	8%	00%
6) Other systemic effects like shock/septicemia	12%	20%

Inference: Delayed resolution 29% in present series is comparatively less than the incidence in previous studies. The better clinical outcome and decreased incidence of delayed response may be Attributable to better medical facilities and early diagnosis, treatment and effective antimicrobial Agent in present series when compare to old study which was conducted in the year 1985 when Effective antimicrobial agents were relatively less.Synpneumatic effusion is the other most common complication, which is comparable to12%incidence in the previous study series. Other systemic manifestation apart from shock and septicemia includes complication like meningitis and toxic hepatitis secondary to septicemia which occurred at a rate of 20% in the present series that was basically reported in those case who showed inconclusive etiological diagnosis which proves that the incidence of complications is more with atypical organism and esp. with gram negative septicemia.

TABLE 12: Incidence of Motality (as %)

Mortality	Vali series[6] 1985	White series[8] 1981	Present study 2011
	15%	8%	00

Inference: Mortality rate in the present study was 00% as compare to 15% in Vali series. It can be attributed to high incidence of complications and gram negative infection in the Vali series.

CONCLUSION

1) More common age group in present study affected is middle age(30-50)
2) Male affected more than female.
3) The Rt. lobe being affected more than Lt. lobe.
4) Predisposing factor in present study are smoking and other medical illness like DM, Renal failure etc.
5) Radiography (as CXR.s) followed by Sputum investigation (in its varius forms) contribute to diagnosis of pneumonia.
6) Common organism responsible for CAP in present study is *Staphylococous aureas* followed by *Psudomonas aeruginosa.*
7) Delayed resolution is most common complication of pneumonia followed by septicaemia, collapse of lung and synpneumonic effusion.

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