Original Article

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Microbiological Profile and Drug Sensitivity Pattern among Community Acquired Pneumonia Patients in Tertiary Care Centre in Mangalore, Coastal Karnataka, India

Internal Medicine Section

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ABSTRACT

Background: Community Acquired Pneumonia (CAP) is the most common respiratory tract infection in day to day practice. The knowledge of organism commonly causative of CAP helps in early empirical treatment initiation.

Aim: To study the microbiological profile of patients with community acquired pneumonia and to study drug sensitivity pattern.

Methods: Hospital based cross sectional study among 100 patients with CAP was conducted in a tertiary care hospital of Southern India. Sputum culture showed that out of 100 patients 39 had an identifiable etiology with 12 patients having evidence of mixed infection.

Result: Micro-organisms isolated in sputum culture were *Streptococcus pneumoniae* (31%) followed by, *Pseudomonas pyogens* (15%), *Klebsiella pneumonia*e (13%). AFB smear was found to be positive in 6 patients. Organisms were found to be sensitive for piperacillin plus tazobactum (41%), aminoglycocides (amikacin-46%, gentamicin-31%), third generation cephalosporins (Cefotaxim-36%, Ceftriaxone-18%) and macrolides (Erythromicin-31%, Azithromycin-18%). Sensitivity to chloramphenicol was observed in 31% sputum culture positive patients. Ciprofloxacin sensitivity was seen among 49%.

Conclusion: Most of the organisms were found to be sensitive to monotherapy with extended spectrum beta lactamases, third generation cephalosporins, fluroquinolones, macrolides.

Keywords: Coastal southern india, Community acquired pneumonia, Drug sensitivity, Microbiological profile

INTRODUCTION

Respiratory tract infections are the most frequent of all the infections and account for the large number of work days lost in the general population. Among them, pneumonia is the commonest disease with a high prevalence in the community and a cause for significant mortality and morbidity. Pneumonia is broadly defined as any infection of lung parenchyma [1]. Pneumonia is clinically divided into community acquired pneumonia (CAP) and nosocomial pneumonia. Infectious Diseases Society of America (IDSA) defines CAP as "an acute infection of the pulmonary parenchyma that is associated with at least some symptoms of acute infection, accompanied by the presence of an acute infiltrate on a chest radiograph or auscultatory findings consistent with pneumonia in a patient not hospitalized or residing in a long-term care facility for more than 14 days before onset of symptoms" [2,3]. Aetiology of CAP is generally bacterial but the microbial pattern varies from place to place and so does the antimicrobial sensitivity and emerging resistance pattern. CAP is the leading cause of death in the world. But the seriousness of CAP, despite being a reasonably common and potentially lethal disease, often is underestimated by physicians and patients alike [4]. The treatment of CAP is complicated by growing threat of antimicrobial resistance and the tendency to rely on empirical therapy. Recent years have witnessed the emergence of new pathogens and also newer antibiotics designed to combat them [5]. Various studies have been done in different countries for example in Jordan [6], Thailand [7], New York [8] and Chile [9] regarding the microbial etiology and bacterial resistance. But there is limited published data describing microbiological causes of pneumonia in India [10]. Although a wide variety of recognized pathogens cause CAP, the precise etiology, pattern of microbial flora in various settings, antibiotic sensitivity and resistance in India is still not comprehensively studied.

Our study is a sincere attempt to look into various causative agents of CAP, predisposing factors and sensitivity pattern of organisms to plan therapy among patients in limited facility settings.

MATERIALS AND METHODS

It was a Hospital based Cross sectional study conducted in a tertiary care hospital of south India. The study subjects were 100 patients who were diagnosed as suffering from CAP. Inclusion criteria were subjects in the age group of 14 years to 70 years, outpatients with symptoms, signs and laboratory data diagnostic of pneumonia as well as inpatients with pneumonia at the time of hospitalization.

Patients who had already received antibiotics before sputum could be sent for culture sensitivity, aspiration pneumonia, obstructive pneumonia, immune-compromised state, nosocomial pneumonia were excluded from the study.

The sample size was calculated based on expected proportion of CAP among blood /sputum sample as per previous study as 63%. Taking 15% as relative precision and 95% as confidence interval sample size was calculated as 100.

The data was collected using a pre-tested semi-structured proforma which captured the history and diagnosis.

Diagnosis was made on the basis of history, clinical examination, routine blood parameters (complete blood count, ESR) and chest radiograph. On diagnosis, sputum sample were collected as per standard recommended protocols. Sputum samples were collected before the patients received first course of antibiotics. In those patients who were unable to expectorate a satisfactory sputum specimen, sputum induction methods were followed. Sputum samples thus obtained were sent for Gram staining and pyogenic culture and sensitivity to antibiotics. In addition sputum was stained by Ziehl-Neelsen staining for tuberculosis. ATS (American Thoracic

	Sputum Culture	
	Positive	Negative
Age in years	No. (%)	No. (%)
< 20	1(3)	3(5)
20-40	7(18)	17(28)
40-60	16(41)	22(36)
>60	15(38)	19(31)
Total	39	61
Gender		
Male	15(38)	21(34)
Female	24(62)	40(66)
Total	39	61

[Table/Fig-1]: Comparison of Age and Gender distribution with sputum culture positivity

	Sputum Culture	
Co-morbidities	Positive- No. (%)	Negative-No. (%)
COPD	3(10.5)	2(4)
Lung malignancy	7(24)	6(13)
Other malignancies	5(17)	8(17)
Diabetes mellitus	3(10.5)	7(15)
Bronchial asthma	2(7)	8(18)
Tuberculosis	6(20.5)	5(11)
Others	3(10.5)	10(21)
Total	29	46

[Table/Fig-2]: Comparison of Co-morbidities among patients with sputum positive and sputum negative CAP

Micro-organism isolated	No. (%)
Streptococcus pneumoniae	12(31)
Psedomonas aeruginosa	6(15)
Klebsiella pneumoniae	5(13)
Staphylococcus aureus	3(8)
Moraxella catarrhalis	3(8)
E.coli	3(8)
Acinitobacter	3(8)
H.influenza	2(5)
Citrobacter	1(3)
Enterococci	1(3)

[Table/Fig-3]: Microbiological profile of patients with CAP

Society) –IDSA (Infectious Diseases Society of America) guidelines was followed in our study. The collected data was analyzed using SPSS version 11.5.

RESULTS

Among the100 patients 64 were males and only 36 were females. Symptoms on presentation in descending order of frequency were fever with chills, dyspnea, cough, pleuritic chest pain and haemoptysis.

Sputum culture was positive overall among 39 patients of which 15(38%) males and 24(62%) females. Sputum culture positivity was observed among patients above the age of 40 and those with structural lung diseases [Table/Fig-1,2]. A large percentage of patients with pneumonia were sputum culture negative. The reasons for this were a) sick patients with altered sensorium unable to expectorate. b) non- productive cough and thus unable to expectorate a satisfactory sputum sample.

In our study the most frequent pathogen was *Streptococcus pneumonia* followed by *Pseudomonas pyogens* and *Klebsiella pneumonie* [Table/Fig-3].

	Sensitivity Pattern			
Antibiotic	Sensitive		Resistant	
	Number	%	Number	%
Amikacin	18	46	21	54
Cefotaxime	14	36	25	64
Ceftazidime	9	23	30	77
Ceftriaxone	7	18	32	82
Amoxicillin+ clavulinic acid	10	26	29	74
Ciprofloxacin	19	49	20	51
Cefepime	6	15	33	85
Gentamicin	12	31	27	69
Carbapenems	6	15	33	85
Piperacillin+ Tazobactum	16	41	23	59
Cloxacillin	6	15	33	85
Clindamycin	2	5	37	95
Erythromycin	12	31	27	69
Methicillin	3	8	36	92
Vancomycin	5	13	34	87
Chloramphenicol	12	31	27	69
Co-trimoxazole	7	18	32	82
Azithromycin	7	18	32	82

[Table/Fig-4]: Drug sensitivity pattern among patients with CAP

AFB smear for tuberculosis was found to be positive in 6 patients. Organisms were found to be sensitive for piperacillin plus tazobactum (41%), amynoglycocides, third generation cephalosporins and macrolides. Sensitivity to chloramphenicol was observed in 31% sputum culture positive patients. Ciprofloxacin sensitivity was seen among 49% [Table/Fig-4].

DISCUSSION

In our study on CAP to find out the microbiological profile and drug sensitivity in Coastal South India, sputum culture proven pneumonia was observed more commonly among patients above the age of 40 years which is very similar to the observations noted by Shah et al., [11] in a study on bacteriological profile of CAP.

Community acquired pneumonia in a immune-competent patient with a healthy lung is on the decline due to increasing use of broad spectrum antibiotics initiated early in the course of the disease. That possibly explains the findings in our study wherein out of 39 patients with culture yield 24 were having co-existing co-morbidities.

Common co-morbidities which included structural lung diseases in the form of malignancy of lungs, chronic obstructive pulmonary disease (COPD), bronchial asthma and bronchiectasis. However extra-pulmonary systemic diseases such as - diabetes mellitus, extra pulmonary malignancies, renal insufficiency, chronic neurological disease, and chronic liver disease were also seen to predispose to CAP. This is comparable with the study done by Shah et al., [12] bacteriological profile of CAP.

Among the co-morbidities bronchogenic carcinoma was quite common as it leads to obstructive pneumonia. Diabetes mellitus was another cause of CAP. Pneumonia in diabetic patients is often atypical, caused by more virulent organisms and associated with increased antibiotic resistance 1. Community acquired pneumonia in uncontrolled diabetic patients are more frequently due to *Klebsiella, Pseudomonas* and *S. aureus* and frequently they are resistant to Ceftriaxone and oral antibiotics [13].

COPD with pneumonic exacerbations with positive sputum culture were also seen in our study. *Haemophilus influenzae*, *Streptococcus pneumoniae* and *Moraxella catarrhalis* account for up to 50% of episodes of AECB. Gram-negative bacilli are more likely to occur in patients with more severe lung disease COPD with pneumonic

exacerbations with positive sputum culture were also seen in our study. *Haemophilus influenzae, Streptococcus pneumoniae* and *Moraxella catarrhalis* account for up to 50% of episodes of AECB. Gram-negative bacilli are more likely to occur in patients with more severe lung disease.

The role of the microbiology laboratory in the diagnosis of CAP remains controversial. As per Gupta, et al., [14] National pneumonia guidelines, yield of sputum culture varies from 34% to 86% .In our study, organism was found only in 39% of sputum culture reports; it is still recommend sending a routine sputum culture with Gram stain to optimize antibiotic therapy for each individual patient as well as to monitor for drug-resistance among pathogens.

Choosing the proper antibiotics as initial empiric therapy & later streamlining as per the culture sensitivity pattern is critical in outcome of CAP. Important considerations include penetration into respiratory secretions, spectrum of activity and antimicrobial resistance. These factors limit the usefulness of drugs such as amoxicillin, erythromycin and trimethoprim-sulfamethoxazole.

Woodhead et al., [15] in a study found that in non-severe CAP oral β lactam antibiotics, macrolides, or fluoroquinolones are qually effective when judged by clinical cure and mortality. They recommended that β lactam antibiotic (with macrolides and tetracyclines as good alternatives in individuals who are hypersensitive to penicillin) should usually remain the preferred therapy for patients with non-severe community acquired pneumonia managed in the community or in hospital and among β lactam antibiotics, as oral cephalosporins have poor pharmacokinetics it would seem that amoxicillin or amoxicillin-clavulanate should usually be the first choice for therapy.

In our study population most of them showed good response to injectable 3rd generation cephalosporins or macrolides or in combination. However sensitivity pattern among the patients with sputum positivity showed aminoglycosides (amikacin and gentamicin) as better sensitivity compared to others, however considering the age and risk of renal impairment still 3rd generation cephalosporins and macrolides will be considered superior. Important observation of our study was sensitivity towards β-lactamase inhibitors which is promising especially among patients with structural lung disease.

LIMITATIONS

Relevant outcomes such as speed of response, subsequent relapse rates, and harmful antibiotic effects and health economic burden of different antibiotic treatment regimens, were not assessed. As per the standard operating protocols of the microbiology laboratory here sensitivity was done only to a group of relevant antibiotics once a specific organism was cultured, based on spectrum of antibiotics as per the literature and local practice.

CONCLUSION

Sputum culture is an essential step in knowing microbiological profile and drug sensitivity among patients with CAP.

Culture positivity alone as such cannot be used to treat clinically suspected CAP. Third generation cephalosporins with or without combination with macrolides and carbapenems showed better sensitivity profile.

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