

SPECTRUM OF BACTERIA ISOLATED FROM BRONCHOALVEOLAR LAVAGE IN A TERTIARY CARE CENTRESowmya K. N¹, Sevitha Bhat², K. Vishwas Saralaya³**HOW TO CITE THIS ARTICLE:**

Sowmya K. N, Sevitha Bhat, K. Vishwas Saralaya. "Spectrum of Bacteria Isolated from Bronchoalveolar Lavage in a Tertiary Care Centre". Journal of Evolution of Medical and Dental Sciences 2014; Vol. 3, Issue 28, July 14; Page: 7950-7954, DOI: 10.14260/jemds/2014/2995

ABSTRACT: BACKGROUND/OBJECTIVES: Pneumonia is an inflammatory condition of the lung caused by bacteria, viruses, fungi and parasites. The common bacterial pathogens include *Pseudomonas* spp., *Klebsiella pneumoniae*, *S. aureus*, *Acinetobacter* spp., *Streptococcus pneumoniae*. Antibiotic resistance is common among these bacterial isolates. This study was taken up to identify the spectrum of bacteria isolated from bronchoalveolar (BAL) samples of patients suffering from lower respiratory tract infections and to determine their antibiogram. **MATERIALS and METHODS:** The retrospective study was carried out in a tertiary care centre over a period of one year (March 2013-February 2014). Patients above 18 years with clinical suspicion of pneumonia were included in this study. The samples with growth $>10^4$ CFU/ml of bacteria were identified and their susceptibility pattern to various antibiotics was performed. **RESULTS:** Out of 307 BAL samples, 110 were culture positive. The common bacterial pathogens isolated were *Pseudomonas* spp. (21.8%), *Acinetobacter* spp. (15.5%), *Klebsiella* spp. (14.5%), *Enterococcus* spp. (10.9%) and *S.aureus* (12.7%). Carbapenem resistance was seen in 31.6% of *Acinetobacter* spp, 22% *Klebsiella* spp. and 14% in *Pseudomonas* spp. Methicillin resistance was detected in 21.4% of *S.aureus* isolates. All strains of *S.aureus* were sensitive to vancomycin and teicoplanin. All isolates of *Enterococci* were sensitive to vancomycin, teicoplanin and high level aminoglycosides. **CONCLUSION:** *Pseudomonas* and *Acinetobacter* spp. were the most common bacterial pathogens isolated from BAL. Carbapenem resistance is on the rise among these gram negative bacterial isolates.

KEYWORDS: BAL, Bacteria, Antibiotic resistance.

INTRODUCTION: Pneumonia is an inflammatory condition of the lung caused by bacteria, viruses and less commonly by fungi and parasites.¹

Bacteria are the most common cause of pneumonia, the common bacterial pathogens being *Pseudomonas aeruginosa*, *Klebsiella pneumoniae*, *Staphylococcus aureus*, *Acinetobacter* spp, *Streptococcus pneumoniae*, *Escherichia coli*, *Enterobacter* spp., *Haemophilus influenzae*, *Moraxella* spp.¹ Antibiotic resistance is common among the bacterial isolates.²

Several risk factors have been identified for development of pneumonia which include age >65 years, smoking, alcoholism, immunosuppressive conditions and conditions such as COPD, cardiovascular disease, cerebrovascular disease, chronic liver or renal disease, diabetes mellitus and dementia.^{3,4}

Early diagnosis and proper choice of antimicrobials are crucial for successful management of pneumonia⁵. The useful method of diagnosis of pneumonia is quantitative culture of bronchoalveolar lavage (BAL) samples.⁵

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The spectrum of bacterial pathogens and their antibiogram varies in each setting. This study was taken up to study the spectrum of bacteria isolated from BAL with their antibiogram, in our setup.

MATERIALS AND METHODS: This retrospective study was carried out in a tertiary care hospital at Mangalore, South India for a period 1 year (March 2013-February 2014).

Sample size was 307 with 95% confidence level and 85% power. The study included patients over 18 years of age, with clinical suspicion of pneumonia. BAL was collected through flexible bronchoscopy in all cases. All samples were cultured on MacConkey's agar, sheep blood agar and chocolate agar. Plates were incubated at 37°C overnight and a positive quantitative culture was defined when bacteria were cultured from BAL samples at a concentration of 1×10^4 CFU/mL or more.⁴ The organism isolated was identified and sensitivity to various antibiotics was assessed using the Modified Kirby - Bauer disk diffusion method.

RESULTS: Of the 307 BAL samples studied, 110 (35.8%) of the samples had growth of bacteria ($\geq 10^4$ CFU/ml), 105 samples (34.2%) yielded no growth and 95 (29.9%) of samples had no significant growth. The spectrum of bacterial isolates is shown in Table 1. The antibiotic sensitivity pattern of Gram positive cocci and Gram negative bacilli are shown in Tables 2 and 3 respectively.

DISCUSSION: Pneumonia is inflammation of the lung, most commonly caused by bacteria. To arrive at a diagnosis, quantitative culture of BAL plays an important role. The knowledge of the bacterial pathogens with their antibiogram in the setup helps in better management of cases of pneumonia. In quantitative cultures of BAL in our study, positive culture yield was 35.8%, which is comparable with results of other studies.⁴

In our study, *Pseudomonas* spp. was the most common bacterial isolate followed by *Acinetobacter* spp. A study performed in the medical wards of tertiary care teaching hospital in South India had the most common isolate as *Pseudomonas aeruginosa* 35.7% followed by *Klebsiella* spp.⁶ In a study performed at Medical college in Korea involving 340 patients, the common bacterial isolates in 18 positive cultures included MRSA, *Acinetobacter baumannii* and *Pseudomonas aeruginosa*.⁴ We have not distinguished between cases of community acquired and nosocomial pneumonia.

Antibiotic resistance is emerging among Gram negative bacterial isolates especially among the nosocomial pathogens.^{7,8}

Carbapenem resistance was seen in 22% of the isolates of *Klebsiella* spp. and 5 of 16 *Klebsiella* spp. were ESBL producers.

Acinetobacter spp. showed highest sensitivity to Cefoperazone sulbactam (84.6%). Carbapenem resistance was seen in 31.6% of the isolates and this high carbapenem resistance could be because of the hospital origin of the isolates.^{9,10}

Pseudomonas spp. showed good sensitivity to cephalosporins 84%, ciprofloxacin 78%, carbapenems 85%, and Piperacillin-Tazobactam 95%. This is in contrast to the other studies where levels of resistance to cephalosporins and carbapenems was high (38%).¹¹

In our study, all strains of *S. aureus* were sensitive to vancomycin and teicoplanin and 5 of 14 isolates were MRSA. Enterococci showed 100% sensitivity to vancomycin, teicoplanin and high level aminoglycosides, which is similar to the previous studies.

IMPLICATIONS OF THE STUDY: The study provides data regarding the incidence rate of various bacterial pathogens isolated from BAL in our setup along with their antibiogram. The majority of significant bacterial isolates from BAL included *Pseudomonas* spp. and *Acinetobacter* spp. Carbapenem resistance is on the rise among the Gram negative bacilli.

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Bacterial isolates	Number (%)
Pseudomonas spp.	24 (21.80)
Acinetobacter spp.	17 (15.45)
Klebsiella spp.	16 (14.45)
Staphylococcus aureus	14 (12.72)
Enterococcus spp.	12 (10.9)
Streptococcus pneumoniae	9 (8.18)
Others (Moraxella, Haemophilus spp.)	18 (16.36)
Total	110

Table 1: Bacterial isolates from BAL fluid

Antibiotics	Enterococcus spp.	S. aureus
Ampicillin	100	Not done
Erythromycin	Not done	63.3
Gentamicin	Not done	78.57
HLG andHLS	100	Not done
Penicillin	23.3	Not done
Vancomycin	100	100

Table 2: Antibiotic sensitivity pattern of Gram positive cocci from BAL in %.*

*Sensitivity is expressed as percentage

Antibiotic	Klebsiella spp.	Acinetobacter spp.	Pseudomonasspp.
Ampicillin	14.2	Not done	16
Ceftazidime	41.2	33.3	84.2
Cefotaxime	46.6	21	71.4
Ciprofloxacin	66.6	50	78.9
Cefaperazone + sulbactam	85.7	84.61	85.7
Gentamicin	100	66.6	57.89
Imipenem	100	62.5	100
Meropenem	92.85	46.6	86.36

Table 3: Antibiotic sensitivity pattern of Gram negative bacilli from BAL in %*

*Sensitivity is expressed as percentage

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Date of Submission: 30/06/2014.

Date of Peer Review: 01/07/2014.

Date of Acceptance: 08/07/2014.

Date of Publishing: 14/07/2014.