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ANTIBIOGRAM OF PSEUDOMONAS AERUGINOSA ISOLATED FROM VENTILATOR ASSOCIATED PNEUMONIA IN A TERTIARY CARE HOSPITAL

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ABSTRACT

VAP is the most common nosocomial infection in the intensive care unit (ICU) with an incidence ranging from 8% to 28% in mechanically ventilated patients. The mortality and the morbidity associated with VAP can be reduced by early identification of the pathogen and administration of appropriate antimicrobial therapy. Pseudomonas aeruginosa is a major nosocomial pathogen, which causes variety of infections such as pneumonia, urinary tract infections, surgical site infections and bacteremia. It accounts for 9-10% of hospital infections. Antibiotic resistance, a global concern, is particularly pressing in developing nations, including India. Drug resistance is due to many factors such as overuse and misuse of antibiotics, incorrect choice of an antibiotic, poor compliance etc. . The aim of the present study was to know the prevalence and antibiogram of pseudomonas aeruginosa isolated from VAP. This was a retrospective study conducted at a tertiary care hospital in South India. The data was obtained from the Microbiology department from March 2009 to March 2011. Most common gram positive organism was coagulase negative staphylococci and most common gram negative bacilli was Acinetobacter baunannii followed by Pseudomonas aeruginosa. Pseudomonas aeruginosa was resistant to most commonly used antibiotics, highest resistance was seen with Cephalosporin group followed by Fluoroquinolones (table 3). Least resistance was seen with Aztreonam followed

by Imipenem. Increasing Cephalosporin and Fluoroquinolone resistance is a matter of concern. Local bacteriological data should be collected regularly and such information should be utilized in guiding the empirical antibiotic therapy and also to develop an effective antibiotic policy.

Key words: Ventilator associated pneumonia (VAP), antibiogram, resistance, intensive care unit

INTRODUCTION

Ventilator-associated pneumonia (VAP) is defined as pneumonia occurring more than 48 hours after the initiation of endotracheal intubation and mechanical ventilation including pneumonia developing even after extubation [1]. VAP is the most common nosocomial infection in the intensive care unit (ICU) with an incidence ranging from 8% to 28% in mechanically ventilated patients [1, 2]. The mortality and the morbidity associated with VAP can be reduced by early identification of the pathogen and administration of appropriate antimicrobial therapy.

The international study of infections in intensive care unit (ICU), which was conducted in 2007, demonstrated that the patients who had longer ICU stays had higher rates of infection, especially infections due to resistant Staphylococci, Acinetobacter, Pseudomonas species, Candida species [3]. Delay in initiating appropriate antimicrobial therapy, can increase the mortality associated with VAP, and thus therapy should not be postponed for the purpose of performing diagnostic studies [4]. Empirical therapy can be initiated based on the knowledge of local prevalence and sensitivity pattern of the pathogens at a particular region.

Pseudomonas aeruginosa is a major nosocomial pathogen, which causes variety of infections such as pneumonia, urinary tract infections, surgical site infections and bacteremia. It accounts for 9-10% of hospital infections [5]. Antibiotic resistance, a global concern, is particularly pressing in developing nations, including India [6]. Drug resistance is due to many factors such as overuse and misuse of antibiotics, incorrect choice of an antibiotic, poor compliance etc. The patterns of organisms causing infections and their antibiotic resistance pattern vary widely from one country to another, as well as from one hospital to other. The aim of the present study was to know the prevalence and antibiogram of pseudomonas aeruginosa isolated from VAP.

MATERIAL AND METHODS

This was a retrospective study conducted at a tertiary care hospital in South India. The data was obtained from the Microbiology department from March 2009 to March 2011.

Inclusion criteria

The diagnosis of VAP was established using clinical pulmonary infection score (CPIS), which was evaluated on a daily basis until the patient was on ventilator support. CPIS of greater than six was used as diagnostic criteria for VAP [7].

Exclusion criteria

Patients with clinical and radiological signs suggestive of pneumonia on admission.

Collection of the Endotracheal Aspirate

Endotracheal aspirate was preferred over protected specimen brush sampling and broncho-alveolar lavage, as these techniques are more invasive and studies have shown no mortality benefit of using these over endotracheal aspirate [8-10]. Only one sample was collected from each patient and was immediately taken to the laboratory for processing.

Microbiological processing

Gram stain preparations were made from all aspirate samples within the first hour. Samples were inoculated onto 5% blood agar, MacConkey agar, which were reconstituted according to the manufacturer's specifications, and sterilised at 121°C for 15 minutes. The plates were incubated at 37°C for 18-24 hours. positive Gram stain (> 10 polymorphonuclear cells/ low power field and > 1 bacteria/ oil immersion field with or without the presence of intracellular bacteria) and quantitative endotracheal aspirate culture showing > 105 colony forming units/ ml [11-13].Based on the clinical and microbiological criteria, 59 out of 153 patients admitted were diagnosed with VAP. The organisms isolated were identified by standard microbiological techniques [14].

The isolates were tested for their antimicrobial susceptibility and the results interpreted by modified Kirby Bauer disc diffusion method, according to the guidelines of Clinical and Laboratory Standards Institute[15]. The following anti-microbials were used, Piperacillin (100 mcg), Piperacillin+tazobactum (100/10mcg), Ciprofloxacin (5mcg), Ofloxacin (5mcg), Gentamicin (10mcg), Amikacin (30mcg), Cefepime (30mcg), Cefuroxime (30 mcg), Ceftriaxone (30mcg), Ceftazidime (30mcg), Aztreonam (30mcg), Imipenem (10mcg) (Hi

Media, Mumbai). Pseudomonas aeruginosa ATCC 27853 was used as the control strain. The information was recorded and analyzed using Microsoft Excel (2010 version) and the results are explained in frequency and percentage.

RESULTS

A total of 246 patients were on Ventilator, out of which 59 patients had VAP, incidence of 23.9%. The age and sex distribution of patients is shown in table 1.

Table 1 Age and sex distribution of the patients

Age group (years)	Male	Female	Total
0-10	5	6	11
10-20	3	3	6
20-40	14	11	25
40-60	7	6	13
>60	3	1	4
Total	32	27	59

Maximum number of cases were from age group of 20-40 yrs and maximum patients were male.

Table 2 Bacterial Isolated from VAP (n=59)

Organism	Number	Percentage
Gram positive		
Staphylococcus aureus	7	11.8
Streptococcus pneumoniae	5	8.4
CONS	8	13.5
Enterococci species	2	3.3
Gram negative		
Pseudomonas aeruginosa	11	18.6
Klebsiella pneumonia	7	11.8
Acinetobacter baunannii	12	20.3
Haemophilus influenzae	2	3.3
Escherichia coli	3	5.08
Citrobacter spp	2	3.3

CONS = Coagulase negative staphylococci

Most common gram positive organism was CONS and most common gram negative bacilli was Acinetobacter baunannii followed by Pseudomonas aeruginosa

Table 3 Antibiogram of Pseudomonas aeruginosa (Resistance pattern). (n=11)

Antibiotic	Number	Percentage
Piperacillin	6	54.5
Piperacillin+tazobactum	4	36.3
Ciprofloxacin	8	72.7
Ofloxacin	7	63.6
Gentamicin	3	27.2
Amikacin	2	18.1
Cefepime	9	81.8
Cefuroxime	9	81.8
Ceftriaxone	10	90.9
Ceftazidime	8	72.7
Aztreonam	0	0
Imipenem	1	9.09

Maximum resistance was seen with Cephalosporin group and least with Imipenem and Aztreonam.

DISCUSSION

Delay in initiating appropriate antibiotic therapy can increase the mortality associated with VAP, and thus therapy should not be postponed for the purpose of performing diagnostic studies [16,17]. One of the reasons for increased antibiotic resistance is inappropriate selection of empirical therapy [18]. Thus the empirical therapy should be based on the local bacteriological profile, patient demographics and local hospital conditions. In the present study, incidence of VAP was 23.9%. In other studies the incidence varied between 15.5-47% [19-22].

The majority of bacterial isolates in our study were gram negative bacilli (table 2). Acinetobacter baunannii was the most common organism followed by Pseudomonas aeruginosa. The organisms isolated were similar to other studies [19-22]. Pseudomonas aeruginosa was resistant to most commonly used antibiotics, highest resistance was seen with Cephalosporin group followed by Fluoroquinolones (table 3). Least resistance was seen with Aztreonam followed by Imipenem. Recent studies also report similar resistance pattern [23,24].

Despite advances in sanitation facilities and the introduction of a wide variety of antimicrobial agents with antipseudomonal activities, Pseudomonas aeruginosa is still responsible for life threatening infections. Nosocomial infections caused by Ps. aeruginosa are difficult to treat because of both intrinsic resistance of the species and its ability to

acquire further resistance to multiple groups of antimicrobial agents including β-lactams, aminoglycosides and fluoroquinolones [25]. P. aeruginosa is an epitome of opportunistic nosocomial pathogen and despite therapy, the mortality to nosocomial pseudomonal pneumonia is approximately 70% in immunocompromised patients. Unfortunately, it demonstrates resistance to multiple antibacterial, thereby jeopardizing the selection of appropriate treatment [26].

The present study has certain limitations, this was a retrospective study and the sample size was small. We did not include multidrug resistant strains using molecular methods. Future studies should include the above parameters.

CONCLUSION

Pseudomonas aeruginosa was resistant to most commonly used anti-pseudomonals. Increasing Cephalosporin and Fluoroquinolone resistance is a matter of concern. Local bacteriological data should be collected regularly and such information should be utilized in guiding the empirical antibiotic therapy and also to develop an effective antibiotic policy. We suggest restricted and rational use Amikacin and Piperacillin+tazobactum in our hospital setting to prevent rapid emergence of resistance.

Conflict of interest: None

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