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Antibiotics Susceptibility Patterns of Bacterial Isolates among Ventilator Associated Pneumonia in Tertiary Care Hospital, Jamnagar, Gujarat

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ABSTRACT

Introduction :Ventilator-associated pneumonia (VAP) is defined as pneumonia occurring more than 48 hrs after patients have been intubated and received mechanical ventilation. Diagnosing VAP requires a high clinical suspicion combined with bedside examination, radiographic examination and microbiological analysis of respiratory secretions Material and method: Samples were either aspirated by disposable syringes and transferred into sterile glass test tubes or collected onto sterile cotton wool swabs, aseptically and inoculated on Blood agar and Mac Conkey's agar. After 24 hours of incubation at 37^0 c of all agar plates, culture Characteristics of colony were observed. Gram stain of colony were done and according to gram positive or gram negative bacteria they were proceed for biochemical tests and antibiotic sensitivity testing. Results: Out of total 250 samples, 135 (54) shows growth. From 135 positive cultures, predominant organisms were Pseudomonas aeruginosa 60 (41.37%) followed by S. aureus 34 (23.44%), Maximum sensitive drug

KEYWORDS: Ventilator associated Pneumonia, Gram negative bacteria, Gram positive bacteria

INTRODUCTION

Ventilator-associated pneumonia (VAP) is defined as pneumonia occurring more than 48 hrs after patients have been intubated and received mechanical ventilation. It is commonly classified as either early onset (occurring within 96 hours of start of mechanical ventilation) or late onset (>96 hours after start of mechanical ventilation).Diagnosing VAP requires a high clinical suspicion combined with bedside examination, radiographic examination and microbiological analysis of respiratory secretions 1. Eighty-six percent of nosocomial pneumonias are associated with mechanical ventilation and are termed as ventilator-associated pneumonia (VAP). The mortality attributable to VAP has been reported to the range between 0 and 50%. Studies have provided different results when determining attributable mortality, in part because of very different populations (less-acute trauma patients, acute respiratory distress syndrome [ARDS] patients, and medical and surgical ICU patients) and in part as a result of variances in appropriate empirical medical therapy during the initial 2 days.2,3,4

MATERIAL AND METHOD

A prospective study was carried out at department of microbiology, in a tertiary care hospital, Jamnagar from June 2009 to July 2010.Total 250 patients who were kept on mechanical ventilator were randomly selected. Patients admitted in Intensive Care Unit or transferred to the unit from other medical or surgical wards for any medical conditions/ complications and kept on mechanical ventilator for >48 hours are included. Patients already having pneumonia at the time of ICU admission or Patients who developed pneumonia in the first 48 hours of mechanical ventilation or Patients of ARDS are excluded from the study. Samples were either aspirated by disposable syringes and transferred into sterile glass test tubes or collected onto sterile cotton wool swabs, aseptically. All the samples were transferred to the laboratory soon after being obtained .From the samples smears were made for Gram Stain. The samples were inoculated on Nutrient agar, MacConkey's medium and Blood agar plates. The culture plates were incubated aerobically for 24 hrs at 37°C. All inoculated plates were observed next day. The colony characteristics were noted down; gram staining and motility by hanging drop preparation were done from colony and observed microscopically. For identification of isolates, following biochemical media were inoculated and incubated at 37˚C for 24 hours. For identification of gram negative organisms oxidase test,catalase test, Indole test, Methyl red test, Citrate test, Triple sugar iron test, Urease test, Phenylalanine deaminase test and Sugar fermentation tests were used while for gram positive organisms catalase test and coagulase test were used. The antibiotic susceptibility pattern of all the strains were determined by modified Kirby Bauer disc diffusion method using Muller-Hinton agar and were interpreted after incubation for 24 h at 37°C. The zone diameters measured around each disk were interpreted on the basis of guidelines published by the Clinical and Laboratory Standards Institute(CLSI).

RESULTS AND ANALYSIS

Total 250 samples were tested. Out of it 135 shows growth(54%). Out of 135, most samples are of endotracheal tube 115 (85.18%), samples of tracheostomy tube were 19 (14.07%) while only 1 sample (0.74%) was from brochoalveolar lavage (BAL). In present study incidence of late onset VAP was higher 82 (60.74%) than early onset VAP 53 (39.25%).Gram negative organisms predominates 102 (70.34%), while gram positive organisms were 43 (29.65%).Table 1 shows that most common organism isolated was Ps. aeruginosa 60 (41.37%), second common organism was S. aureus 34 (23.44%), followed by Klebseilla 21 (14.48%), E. coli 15 (10.34%), Coagulase negative staphylococci (CONS) 09 (6.20%), Proteus spp. 04 (2.75%) and Acinetobacter spp. were 02 (1.37%).

Table 1
No. of organisms isolated from the samples

Name of isolates	Total no.	Percentage
Pseudomonas aeruginosa	60	41.37%
Staphylococcus aureus	34	23.44%
Klebseilla	21	14.48%
Escherichia coli	15	10.34%
Coagulase negative staphylococci (CONS)	09	6.20%
Proteus spp.	04	2.75%
Acinatobacter spp.	02	1.37%
Total	145	100.00%

Table 2
Antibiotic sensitivity pattern of pseudomonas (60 isolates)

Name of antibiotic	Sensitivity
Amikacin (AN)	26.66%
Gentamycin (G)	21.66%
Ticara + clauv acid (TR)	26.33%
Cefepime (CPM)	8.33%
Ciprofloxacin (CIP)	34.31%
Ceptazidime (CPZ)	21.66%
Tobramycin (TB)	15.00%
Aztreonam (AS)	0.00%
Meropenam (MR)	57.80%
Piperacillin + Tazobactam (PT)	46.66%
Levofloxacin (LV)	10.52%

Table 2 shows that most sentsitive antibiotic for pseudomonas is Meropenem(57.80%) followed by Piperacillin&Tazobactam (46.66%) Ciprofloxacin (34.31%) and Amikacin(26.6%), Table 3 shows that most sensitive antibiotic for Gram Positive cocci is Vancomycin (68.33%) followed by Teicoplanin (66.67%) , Amikacin (42.53%) Augmantin(37.01%), Azithromycin (31.37%), Cefotaxime(29.57%) and cefoperazone(28.43%).Table 4 shows that most sensitive antibiotic for gram negative organism is Colistin (63.89%) followed by Piperacillin –Tazobactam (61.67%), Amikacin (51.43%), Augmentin(50.65%),gentamicin(32.20%),Gatifloxacin(31.67%),cefoperazone(23.81%), Ceftazidime(22.80%).

Table3
Antibiotic sensitivity pattern of gram positive cocci

Amikacin (AN)	42.53%
Ciprofloxacin (CIP)	24.80%
Gentamycin (G)	22.34%
Cefotaxime (CF)	29.57%
Cefoperazone (CFP)	28.43%
Azithromycin (AZ)	31.37%
Cotrimoxazole (CT)	10.29%
Penicillin (P)	10.29%
Augmentin (AU)	37.01%
Teicoplanin (TC)	66.67%
Levofloxacin (LV)	26.67%
Vancomycin (V)	68.33%

Table 4
Antibiotic sensitivity pattern of Gram Negative Bacilli (Percentage)

Antibiotic	Klebsiella	E.coli	Proteus	Acinetobacter	Total
Cefoperazone(CFP)	33.33	28.57	33.33	0.00	23.81
Ceptazidime (CPZ)	16.66	14.28	00.00	0.00	22.80
Amikacin (AN)	62.38	63.33	50.00	50.00	51.43
Gentamycin (G)	43.80	30.10	25.00	0.00	32.20
Ciprofloxacin (CIP)	38.57	36.20	25.00	0.00	18.39
Cefotaxime (CF)	19.04	0.00	25.00	0.00	11.01
Ceftriaxone (CTX)	14.28	6.66	50.0	0.00	17.74
Cotrimoxazole (CT)	0.00	12.50	0.00	0.00	3.13
Colistin (CO)	88.88	46.66	56.78	74.13	63.89
Augmentin (AU)	41.66	14.28	66.66	0.00	50.65
Piperacillin + Tazobactam (PT)	100.00	46.66	100.00	35.00	61.67
Gatifloxacin (GT)	100.00	26.66	0.00	65.00	31.67

DISCUSSION

Nosocomial pneumonia (NP) is defined as parenchymal lung infection, occurring after the first 48 hours of hospital admission. It is a major threat to patients admitted to intensive care units (ICU) and receiving mechanical ventilation (MV). Despite the clinical experience and major advances in diagnostic techniques and management, VAP remains a significant problem for intensivists. So, the present study was conducted to identify the organisms isolated from VAP patients and its antibiotic sensitivity pattern in our hospital.In present study, rate of VAP was 54% which is quite comparable with the study of Arindam Dey et al.[5], Christian Brun-Buisson et al.[6], Ruiz M, et al.[7]In present study, late onset VAP was higher (60.74%) than early onset VAP (39.25%). This was comparable with the study of Christian Brun-Buisson et al.6 (early-32% & late-68%), T Rajasekhar et al.[8] (early-73% & late-27%), Dr. Shalini Tripathi et al.[9] (early-46.6% & late-53.3%)**,** Noyal Mariya Joseph et al.10 (early-41.7% & late-58.3%), Arindam Dey et al.[5] (early-47.7% & late-52.3%). In present study, gram negative organism was isolated in higher rate (70.34%) than gram positive organism (29.65%). This was comparable with the study of Arindam Dey et al.[5], Christian Brun-Buisson et al.[6] (gram negative organism-74% & gram positive organism-26%), Mandakini Pawar et al. 200311 (gram negative organism-84% & gram positive organism-16%), Sibel Özkurt et al.[12] (gram negative organism-87.5% & gram positive organism-12.5%), João Manoel da Silva Júnior et al.[13] (gram negative organism-95.7% & gram positive organism-4.3%). Most of the studies found Pseudomonas as the mail culprit for causing VAP. In the present study, 60 cases of VAP caused by Pseudomonas (41.37%). This was comparable with the study of Mandakini Pawar et al. 2003[11], Christian Brun-Buisson et al.[6], Apostolopoulou E et al.[14], **O. Leroy** et al.[15]Staphylococcus aureus was another important pathogen causing VAP.In present study, Against 60 isolates of Pseudomonas aeruginosa Meropenem was the most effective antipseudomonal agent .It is moderately sensitive to β-lactams- β-lactamase inhibitor combination , aminoglycosides and 3rd generation cephalosporins, which was comparable with other studies.[11,16,17,18,19]In present study, gram positive organisms (S. aureus & CONS) showed good sensitivity against vancomycin and teicoplanin. They also showed good sensitivity against aminoglycosides, while showed moderate sensitivity against fluoroquinolones, some β-lactam in combination with tazobactam and macrolide which was comparable with other study. In present gram negative organisms showed good sensitivity against Colistin, Piperacillin –tazobacam combination and moderately sensitive against amikacin, amicillin –sulbactam, gatifloxacin, aztreonam which was comparable with other study.

CONCLUSION

Ventilator-associated pneumonia (VAP) is a leading cause of morbidity and mortality in ICU patients, leading to lengthened ICU and hospital stays and higher health care costs. The mortality caused by VAP increases if it is caused by resistant bacteria. Good management strategies for VAP like adequate infection control practices, early and accurate diagnosis, and more specific antimicrobial use may significantly improve patient's outcome. If VAP is suspected empirical antibiotics, in combination of Vancomycin (for gram positive organism including MRSA), Piperacillin+Tazobactam (for pseudomonas) and aminoglycosides (for gram negative organisms) should be given immediately. Although bacteriological sampling is important, it should not significantly delay the start of treatment. As the appropriateness of the initial antibiotic regimen is a vital determinant of outcome, microbiological advice should be sought. There is an increasing prevalence of MRSA and multidrug resistant pathogens in late onset VAP, and antimicrobial therapy should take account of this. Subsequent microbiological findings should be used to tailor antibiotic therapy.

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