ORIGINAL RESEARCH PAPER
Volume - 12 | Issue - 05 | May - 2023 | PRINT ISSN No. 2277 - 8179 | DOI : 10.36106/ijsr
INTERNATIONAL JOURNAL OF SCIENTIFIC RESEARCH

BACTERIOLOGICAL SURVEILLANCE AND ANTIBIOTIC SUSCEPTIBILITY PATTERN OF THE ISOLATES FROM VENTILATOR ASSOCIATED PNEUMONIA AT TERTIARY CARE HOSPITAL RAJKOT GUJARAT

Medical Microbiology

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ABSTRACT

Background: Ventilator-associated pneumonia (VAP) is the second most common nosocomial infection and accounts for 15–20% of the total HAIs. Identification of bacterial organism and their susceptibility to commonly used antibiotics is very essential for the treatment of the patients. The aim of this study was to isolate and identify bacteria responsible for ventilator associated pneumonia and detect the antibiotics susceptibility pattern of all the isolated bacterial pathogens in endotracheal aspirate culture. **Methods:** This was cross-sectional study and was carried out in Microbiology department, tertiary care hospital, Rajkot from January 2017 to December 2017. Endotracheal aspirate (ETA) was collected under aseptic precautions. The ETAs so collected were subjected to microscopy and culture using standard techniques. All the bacteria isolated were identified by standard biochemical tests and their antibiotic susceptibility testing was performed by the Kirby-Bauer disc diffusion method on Muller-Hinton agar as per the CLSI guidelines. **Result:** Out of total 25 ETA samples from ventilated patients, 14 were culture positive with 56% incidence. In early onset VAP, 14.28% were Klebsiella pneumoniae followed by pseudomonas (7.14%). In late onset VAP, 42.85% were Klebsiella pneumoniae followed by Pseudomonas aeruginosa (14.28), Acinetobacter spp. (14.28%) and E.coli (7.14%). Klebsiella pneumoniae was the most common isolate (57.13%) showed less sensitivity to cotrimoxazole (37.5%), cephalosporins (25%) and ciprofloxacin (12.5%). **Conclusion:** This study provides baseline information of Ventilator associated pneumonia and associated risk factors, organism responsible for VAP and antibiotic susceptibility pattern. This invitro antibiotic sensitivity pattern helps to prepare local antibiotic policies.

KEYWORDS

CLSI, Endotracheal aspirate, Klebsiella pneumoniae, Nosocomial infection, VAP.

INTRODUCTION

Ventilator-associated pneumonia (VAP) is defined as pneumonia that develops more than 48 hours after initiation of mechanical ventilation (MV). Conceptually, VAP is defined as an inflammation of the lung parenchyma caused by infectious agent/s not present or incubating at the time, mechanical ventilation was started. VAP may be caused by spectrum of bacterial pathogens which may be polymicrobial and rarely due to anaerobic bacteria, viruses or fungi. VAP can develop at any time during ventilation, but occurs most often in the first week of mechanical ventilation. Rapid diagnosis and initiation of appropriate antimicrobial agent is of immense importance, as many studies have correlated this delay with rise in mortality.[1] Awareness of the potential microbial causes of VAP and confirmation of the specific cause in an individual patient are essential to guide optimal antibiotic therapy. This is arguably the single most important management decision in the care of these patients, because inadequate initial antibiotic therapy leads to excess mortality,[2,3] and excessive antibiotic therapy increases treatment-related complications and costs and leads to increased prevalence of antibiotic resistance.[3,4,5]

MATERIAL AND METHODS

This study was carried out in Microbiology department, tertiary care hospital, Rajkot from January 2017 to December 2017. Endotracheal aspirate (ETA) was collected under aseptic precautions. A sterile 22 inches suction catheter (Ramsons) was introduced into respiratory tract for a distance of 20-25cms and the specimen was aspirated into a sterile container. The sample was transported to the laboratory immediately for processing. The ETA so collected was subjected to Gram's stain (Microscopy). The specimen was then inoculated for quantitative culture using standard techniques onto MacConkey agar, Blood agar, nutrient agar and Chocolate agar plates using a 4mm sterile Nichrome loop (0.01 ml), and then incubated at 37°C. The plates were examined for growth at 24hrs. All the bacteria isolated were identified by standard biochemical tests such as oxidase test, indole, methyl red, citrate utilization, phenylalanine deaminase test, urease, triple sugar iron test, sugar fermentation test and their antibiotic susceptibility testing was performed by the Kirby-Bauer disc diffusion method on Muller-Hinton agar as per the Clinical and Laboratory Standards Institute guidelines.[6]

RESULTS

Out of total 25 ETA samples from ventilated patients, 14 were culture positive with 56% incidence. Incidence of VAP in male was higher (57.14%) while in female, it was 42.86%. Ventilator associated pneumonia were more common in age group of 41yrs –60yrs (75%) followed by >60 years (66.67%). Maximum samples were from medicine and isolation ward with positivity of 40% and 60% respectively. Out of total 10 cases from isolation ward, 7 were Influenza A H1N1 positive and of them 4 were culture positive. 100% positivity from TBC ward and OB ICU. Early onset VAP and Late onset VAP both are more common in age group of 41-60yrs. In early onset VAP, 14.28% were Klebsiella pneumoniae followed by Pseudomonas (7.14%). In late onset VAP, 42.85% were Klebsiella pneumoniae followed by Pseudomonas aeruginosa (14.28%), Acinetobacter spp. (14.28%) and E.coli(7.14%).

Table I: Early onset and Late onset VAP in relation with age

Age-group	Early onset		Late onset	
	Positive	%	Positive	%
<20	0	0	0	0
21-40	1	7.14%	2	14.28%
41-60	2	14.28%	7	50%
>60	0	0	2	14.28%
Total	3	21.43%	11	78.57%

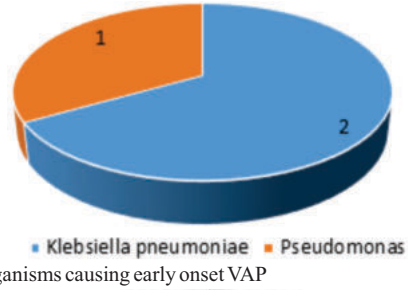

Fig.1- Organisms causing early onset VAP

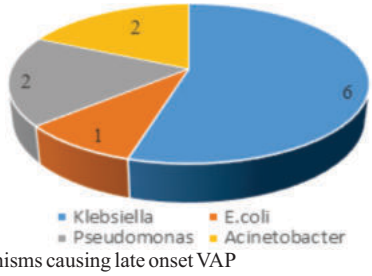

Fig.2- Organisms causing late onset VAP

E. coli were 100% sensitive to Meropenem, Aminoglycosides and 100% resistance to Cephalosporins, Fluoroquinolones and Cotrimoxazole. K. pneumoniae showed 100% sensitivity to Meropenem and Piperacillin+ tazobactam and less sensitive to cotrimoxazole (37.5%), Cephalosporins (25%) and ciprofloxacin (12.5%). Acinetobacter spp. showed less sensitive to Cephalosporins (40%) and Aminoglycosides (25%).

Pseudomonas aeruginosa causing VAP showed 100% sensitivity to Meropenem, Polymyxin B, Amikacin and high resistance to Fluoroquinolones (33.33%) and Aztreonam (33.33%).

Table II: Sensitivity Of Gram-negative Organism Causing In Percentage

Organism	MRP	AK	GM	C	TE	CPM	CAZ	CTX	CAC	CXM	PIT	LE	CIP	COT
E. coli	100	100	100	100	100	0	0	0	0	0	-	0	0	0
Klebsiella	100	87.5	62.5	100	87.5	25	25	25	25	0	100	75	12.5	37.5
Acinetobacter spp.	50	50	-	100	-	50	50	50	50	-	100	-	-	-

Table III: Sensitivity Of Pseudomonas Causing VAP In %

Organism	MRP	PB	CPM	CAZ	CPZ	PIT	PI	AT	CIP	LE	AK
Pseudomonas	100	100	66.67	66.67	0	66.67	66.67	33.33	33.33	33.33	100

DISCUSSION

Incidence in present study was 56% which was higher than the other studies. In Girish N et al[13], incidence was 31.21% and in Gadani et al 37%[14]. The high incidence was may be due to a lower number of cases. In present study occurrence of VAP has no significant difference in gender, it was 57.14% in female and 54.55% in male. Other studies like in Girish et al 2015, there was male predominance (64.70%) and in Gadani et al also there is male predominance (41.93%) was observed. In the present study, VAP was more common in 41-60 years (75%) followed by >60 years (66.67%). Similar result was obtained in other study like in Girish et al 2015, VAP was more common in age group of 41-60years (41.83%). Incidence of early onset VAP and late onset VAP is 14.28% and 50% respectively and both were more common in age group of 41-60 years.

In early onset VAP, Klebsiella (14.28%) was the predominant organism followed by pseudomonas (7.14%) and in late onset VAP more common isolated organism was Klebsiella (42.85%) followed by Pseudomonas (14.28%), Acinetobacter spp. (14.28) and E.coli (7.14%). In Girish et al, most common isolated organism in early onset VAP was Klebsiella (23.07%) that is similar with present study, but in late onset VAP common organism isolated was E. coli (24.14%). E. coli were 100% sensitive to Meropenem, Aminoglycosides and 100% resistance to Cephalosporins, Fluoroquinolones and Cotrimoxazole. K. pneumoniae showed 100% sensitivity to Meropenem and Piperacillin+ tazobactam and high resistance to Cephalosporins (75%), Ciprofloxacin (87.5%) and Cotrimoxazole (62.5%). Acinetobacter spp. showed high resistance to Cephalosporins (60%) and Aminoglycosides (75%).

Organisms isolated in VAP patients showed high resistance to Fluoroquinolones (85.42%), Cephalosporins (78.33%), Cotrimoxazole (62.5%) and most sensitive to Meropenem (100%), Tetracycline (79.17%) and Amikacin (62.5%). Similar result obtained by the Vyawahare et al 2018[15] and Sangamithra et al 2017[16]. In many cases the causative pathogens show multiple antibiotic resistant, it is difficult to select appropriate antibiotics. Early-onset VAP is usually due to the underlying pathology. On the other hand, late-onset VAP could be due to prolonged ventilation, evolution of the underlying disease, quality of nursing care, duration of antibiotic exposure or environmental ecology of the hospital. Studies have shown that previous antibiotic usage decreases early-onset VAP but markedly increases multidrug-resistant (MDR) pathogens.[6]

CONCLUSION

The present study was carried out with the aim to know the rate of Ventilator associated pneumonia in various settings; various risk factors contributing to it, bacteriological profile causing ventilator associated pneumonia and their antimicrobial susceptibility pattern. Antimicrobial stewardship programs should be implemented to improve the safe and appropriate use of antimicrobials, reduce patient harm and decrease the incidence of antimicrobial resistance in the hospitals.

This study provides baseline information of ventilator associated pneumonia and associated risk factors, organism responsible for VAP and antibiotic sensitivity pattern for future surveillance. This invitro antibiotic sensitivity pattern helps to prepare local antibiotic policies.

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