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Bacterial profile of Ventilator associated pneumonia and their Antimicrobial susceptibility pattern at tertiary care hospital

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Abstract
Background - *Ventilator associated pneumonia (VAP) is one of the most common hospital acquired infections among patients in intensive care units and is major cause of mortality and morbidity despite recent advances in diagnosis and treatment. VAP is usually complicated by infection with multidrug resistant organisms. This study was conducted to evaluate the microbial causative agents and their antimicrobial susceptibility pattern in VAP patients and presence of Extented spectrum β lactamase (ESBL) and Methicillin Resistant Staphylococcous aureus (MRSA) in the isolates.* ***Materials and methods****: The present study was conducted from April 2018 to October 2018 and includes 33 patients who were under mechanical ventilation for more than 48 hrs and clinically suspected as VAP. Suction tips and Endotracheal aspirates were obtained from these patients and processed as per standard protocol. Isolates were identified and Antimicrobial susceptibility testing was done by Kirby Baeur disc diffusion method according to CLSI guidelines 2017.* ***Results:*** *Among 44 samples obtained from 33 patients 12(36%) samples were culture positive. The most common organisms isolated was Klebsiella pneumonia 6 (50%) followed by Eschereria coli 3 (25%) , Pseudomonas 1(8.3%), Citrobacter 1(8.3%) and CoNS 1(8.3%). All Gram-negative isolates were sensitive to imipenem and Gram positive organisms are sensitive to cefoxitin.* ***Conclusion:*** *(18.1%) isolates of Gram negative organisms were ESBL producers and no MRSA was isolated in the present study.*
Keywords: *Multidrug resistant; risk factors; ventilator-associated pneumonia.*

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I. Introduction

Ventilator associated pneumonia (VAP) is defined as pneumonia where the patient is on mechanical ventilation for >2 calender days, with day of ventilator placement being day 1. The clinical assessment of Vap is usually based on the presence of fever (temperature more than 38.3°c) blood leucocytosis (>10000mm3) or leucopenia (<4000 per mm3) (1). Purulent tracheal secretions and presence of a new or persistent radiographic infiltrate(2). VAP is identified by using a combination of imaging, clinical and laboratory criteria (1). VAP is one of the most common hospital acquired infections among patients in the Intensive care units, estimated incidence is 10 -12% (3). VAP ranges between 20 0f 1000 and 30 0f 1000 ventilator days based on nosocomial infection surveillance (4). It has the highest associated mortality rate (25-50%) of all hospital acquired infections (3). Highest risk lies early in the course of hospitalisation. Multiple episodes of health care pneumonia may occur in critically ill patients with lengthy hospitalisation . Early onset VAP occurring within 4 days is usually attributed to antibiotic sensitive micro organisms where as late onset VAP is caused by multidrug resistant bacteria(1). VAP bundles are implemented for prevention of VAP which includes elevation of the head end of the bed, oral care , daily interruption of sedation, gastrointestinal prophylaxis, thrombotic disease prevention (3).

II. Materials And Methods

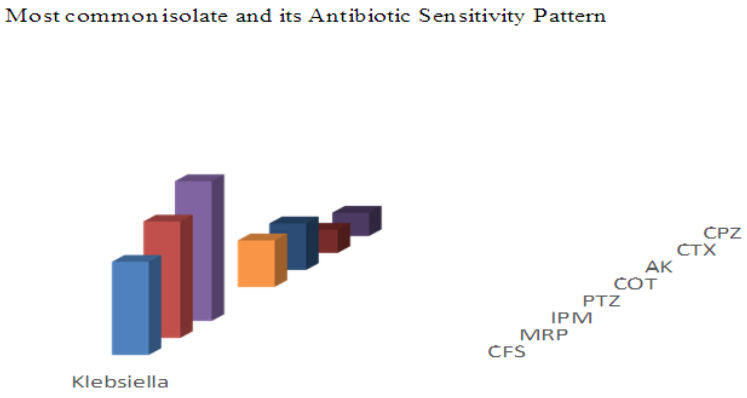
The present study was carried out in the Department of Microbiology, Osmania general hospital, Hyderabad for a period of 7 months from April 2018 to October 2018 after clearance from institutional ethical committee. Patients whose lungs were mechanically ventilated for more than 48 hrs were included in the study. A patient could be included twice when two successive episodes of suspected VAP occurred at least 5 days apart . Specimens included were suction tips and endotracheal aspirates. Blind bronchial sampling using a sterile catheter is blindly introduced through the tracheostomy tube. No saline was injected before or during suctioning

(1). Exclusion criteria are patients with immunosuppression, hematologic neoplasia, (PaO2/fio2 of less than 100 mm Hg), poor oxygenation, unstable heamodynamic condition, HIV infection, cytotoxic chemotherapy induced neutropenia. The parameters recorded were age, sex, severity score assessed by simplified acute physiology score, date of intubation, duration of mechanical ventilation, antibiotics received before sample collection. Endotracheal aspirates were stained by Gram's staining to determine Gram reaction and morphology of bacteria.

III. Results

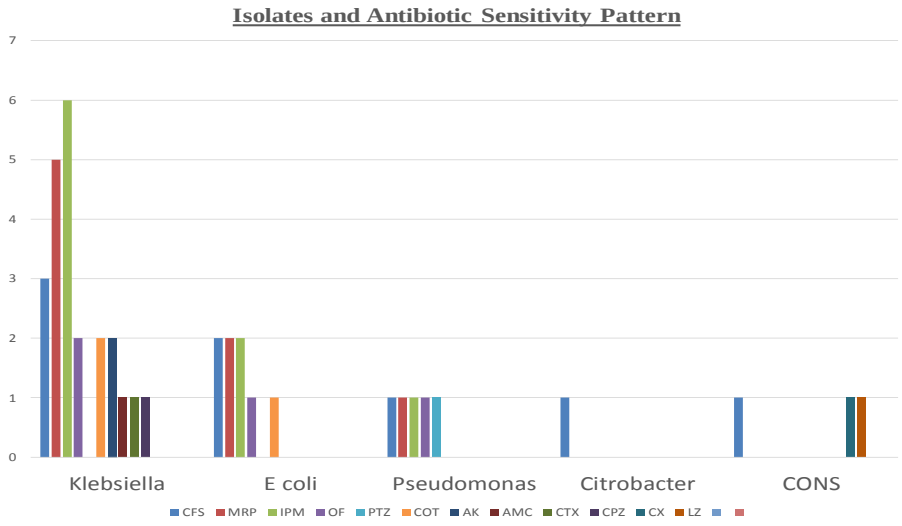
Out of 33 samples processed 12 (36%) were culture positive. Common organism isolated was Klebsiella pneumonia 6(16%). Others include Eschereria coli 3 (8.3%), Pseudomonas aeruginosa 1(2.7%), Citrobacter 1(2.7%), Coagulase negative Staphylococcus aureus 1 (2.7%). All Gram negative isolates were sensitive to imipenem and cefeperazone+sulbactum and resistant to ampicillin. Gram positive isolates (CoNS) were sensitive to cefoxitin. ESBL incidence was 2 (5.5%) in the present study. No MRSA was isolated in the study.

Chart 1: Correlation of drug sensitivity in the Klebsiella isolates.



Antibiotic Sensitivity Pattern of the isolates

	CFS %	MRP %	IPM %	OF %	PTZ %	COT %	AK%	AMC %	CTX %	AMP %	CPZ %	CX %	LZ %
Klebsiella (6 isolates)	66	86	100	33	0	33	33	16	16	0	16	0	0
E Coli (3 isolates)	66	66	66	33	100	33	0	0	0	0	0	0	0
Citrobacter (1 isolate)	100	0	0	100	100	0	100	0	0	0	0	0	0
Pseudomonas (1 isolate)	100	100	100	0	100	0	0	0	0	0	0	0	0
CONS (1 isolate)	100	0	0	0	0	0	0	0	0	0	0	100	100



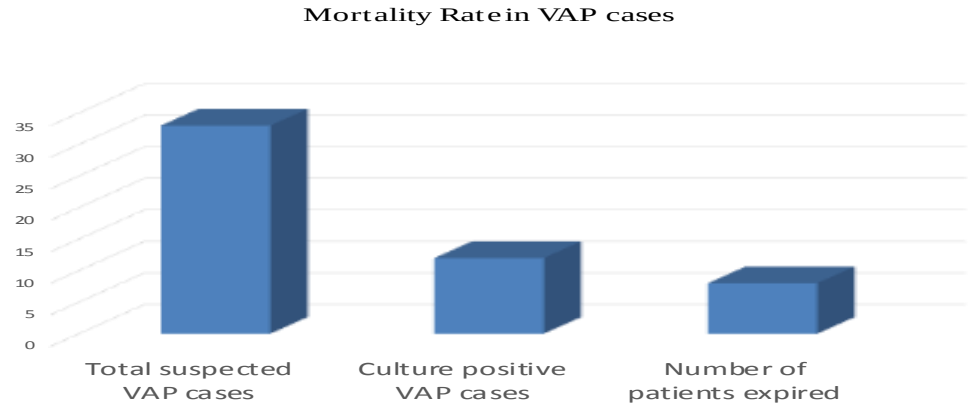
IV. Discussion

The main findings of this study are: 1) Treatment in antimicrobials agents results in a significant decrease in lung bacterial burden . The risk of ventilator associated pneumonia increases with the length of mechanical ventilation (5). Antimicrobial treatment before microbial investigation was the only independent factor inversely associated with significant growth in culture(7). The number of cultures with significant growth was clearly dependent on the presence of prior antimicrobial treatment, with the highest numbers in patients without antimicrobial treatment and lowest in patients with a recently introduced antimicrobial treatment within last 72 hrs before microbial investigation (7). Non bronchoscopic techniques have been advocated as potentially better alternative because of their minimal invasiveness, wide availability and relative inexpensiveness compared with bronchoscopy (4). Length of intensive care unit stay and mechanical ventilation were also not influenced by diagnostic testing.

In this study we have evaluated the clinical diagnosis of Ventilator associated pneumonia, assessed on either the routine clinical estimation at the bed side ,or the modified CPIS and the contribution of the respiratory specimens Gram's stain results to the diagnosis of VAP, taking endotracheal aspirate culture as the reference test (1). Incorporating Gramstain results of the respiratory tract secretions specimen into the score calculation improved the diagnostic accuracy. The CPIS score varied from 0 to 12 points, a CPIS of more than six was associated with a high likelihood of pneumonia and had a sensitivity of 93% and a specificity of 100% (1).

Blot and colleague proposed that when the Gram stain from the PTC (plugged telescoping catheter) sample was positive, empirical therapy should be started because of high specificity of this test, where as negative Gramstain of endotracheal aspirates would suggest withholding therapy because of its high sensitivity(1). Tinsit and colleagues have reported that the accuracy of clinical diagnosis was improved by providing clinicians the result of direct examination of fluid specimen. In the present study incidence of Vap is 36.3% and the most common isolate was Klebsiella.

SERIAL NO.	AGE	SEX	SAPS II SCORE	DURATION OF MV	ANTIBIOTICS	LENGH OF ICU STAY
1.	15	M		8 days	AK,MRP,AMC	40 days
2.	16	F		8 days	AK,MRP,CTX	10 days
3.	20	M	135	12 days	AK,MRP,VAN	42 days
4.	22	F		5 days	AK,MRP,PTZ	8 days
5.	26	F	110	3 days	AK,AMC,CTX	6 days
6	26	F		8 days	CTX,MRP	25 days
7	30	M		5 days	CTX,MRP	5 days
8	35	M		13 days	AK,CTX,IPM	13 days
9	45	M	120	6 days	AK,MRP,PTZ	55 days
10	55	M	134	8 days	CTX,MRP	9 days
11	60	M	120	6 days	CTX,MRP	30 days
12	60	F	60	20 days	AK,MRP,CTX	45 days



Name of the study	%of bacterial isolates(incidence)	Most common organism isolated	Esbl%
Montero et al (2004)		Acinetobacter	
Gadani et al(2010)	43.2%	Pseudomonas	
Atul ashok et al(2014)	36%	Pseudomonas	
Ranjan et al(2014)	57.14%	Acinetobacter	
Si guo et al		Klebsiella	
Ashu sara et al(2016)		Acinetobacter	
Ahmed et al(2017	35.4%	Pseudomonas	
Kapoor et al(2018)	32%	Klebsiella	
Present study(2018)	36.3%	Klebsiella	

V. Conclusion

Knowledge of the susceptibility pattern of the local pathogens can guide the clinicians to choose the appropriate antibiotics according to the likelihood of organisms of early/late-onset VAP. polymyxin B, tigecycline, and vancomycin should be used for successful targeted therapy of MDR pathogens as they showed good *in vitro* activity. Combined approaches of rational antibiotic therapy might be beneficial to combat high antibiotic resistance in our setup.

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