



BACTERIOLOGICAL PROFILE AND ANTIBIOTIC SENSITIVITY PROFILE OF CULTURES ISOLATED FROM ENDOTRACHEAL TUBE TIP IN MECHANICALLY VENTILATED PATIENTS

Microbiology

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ABSTRACT

Aim: To study the bacteriological profile and their antibiotic sensitivity profile in endotracheal tubes, in mechanically ventilated patients, in a tertiary care hospital ICU. **Materials and Methods:** A total of 55 patients admitted in the intensive care unit who were on mechanical ventilation for more than 48hrs were chosen. This study was conducted in the Department of Microbiology, J.L.N. Medical College, Ajmer, Central India, from July 2020 to 17 Jan 2021. Endotracheal tube tips from mechanically ventilated patients in the intensive care unit (ICU), sent for culture and sensitivity in the Microbiology Department, were included in the study. The culture was done on blood and MacConkey agar and the sensitivity pattern was performed on Muller Hinton agar. **Results:** A total of 55 samples were collected during this study period with 8 (14.5%) samples from males, 4 (7.2%) from females, while gender was missing for 43 (78.1%) patients. Positive growth was observed in 40 (72.7%) samples. Majority of isolates were Gram negative bacilli 36 (90%) of which most common was *Acinetobacter* spp11 (27.5%) followed by *Klebsiella pneumoniae* 10 (25%), *Pseudomonas aeruginosa* 7 (17.5%), *E. coli* 5 (12.5%), and *Enterobacter* spp3 (7.5%). Among gram positive spectrum, *Staphylococcus aureus* were isolated from 2 (5%) samples both of which were MRSA. Overall among gram negative bacilli maximum resistance was noted for Cefazolin 100%, Ampicillin 97.2%, Ciprofloxacin 80.5%, Cefotaxim 80.5% followed by Gentamicin 63.8%, Tobramycin 63.8% and Amikacin 52.7%. High sensitivity was seen for Imipenem 86.1% and Piperacillin-tazobactam 66.6%. Among gram positive organisms (*Staphylococcus aureus* n=2) 100% sensitivity was seen for Vancomycin. Sensitivity for Clindamycin was 50%, Erythromycin 50% and Gentamicin 75%. No isolate was sensitive to Ciprofloxacin and Cotrimoxazole. Resistance to Cefoxitin was noted in 100% of *Staphylococcal* isolates.

KEYWORDS

INTRODUCTION:

Infections are the most important and leading cause of morbidity and mortality among the patients admitted in Intensive Care Units (ICU). The formation of biofilm around the Endotracheal Tubes (ET) by the micro organisms and their subsequent dislodgement following ET suction and repeated intubations contributes to lung colonisation and may lead ultimately to ventilator-associated pneumonia. This study aims to know common micro organisms associated with these infections and their antibiotic sensitivity profile.

Materials and Methods:

A total of 55 patients admitted in the intensive care unit who were on mechanical ventilation for more than 48hrs were chosen. This study was conducted in the Department of Microbiology, J.L.N. Medical College, Ajmer, Central India, from July 2020 to 17 Jan 2021. Endotracheal tube tips from mechanically ventilated patients in the intensive care unit (ICU), sent for culture and sensitivity in the Microbiology Department, were included in the study. The culture was done on blood and MacConkey agar and the sensitivity pattern was performed on Muller Hinton agar.

Results:

A total of 55 samples were collected during this study period with 8 (14.5%) samples from males, 4 (7.2%) from females, while gender was missing for 43 (78.1%) patients. Positive growth was observed in 40 (72.7%) samples. Majority of isolates were Gram negative bacilli 36 (90%) of which most common was *Acinetobacter* spp11 (27.5%) followed by *Klebsiella pneumoniae* 10 (25%), *Pseudomonas aeruginosa* 7 (17.5%), *E. coli* 5 (12.5%), and *Enterobacter* spp3 (7.5%). Among gram positive spectrum, *Staphylococcus aureus* were isolated from 2 (5%) samples both of which were MRSA. Overall among gram negative bacilli maximum resistance was noted for Cefazolin 100%, Ampicillin 97.2%, Ciprofloxacin 80.5%, Cefotaxim 80.5% followed by Gentamicin 63.8%, Tobramycin 63.8% and Amikacin 52.7%. High sensitivity was seen for Imipenem 76.1% and Piperacillin-tazobactam 66.6%. Among gram positive organisms (*Staphylococcus aureus* n=2) 100% sensitivity was seen for Vancomycin. Sensitivity for Clindamycin was 50%, Erythromycin 50% and Gentamicin 75%. No isolate was sensitive to Ciprofloxacin and Cotrimoxazole. Resistance to Cefoxitin was noted in 100% of *Staphylococcal* isolates.

Table 1: Antibiotic sensitivity pattern of gram negative isolates

Organism	AMP (S)	AMK(S)	PT (S)	CIP (S)	CTX (S)	IMP (S)	Gen(S)	Tobra(S)	Cz(S)
<i>Acinetobacter</i> (n=11)	0	2	7	0	0	10	2	2	0
<i>Klebsiella pneumoniae</i> (n=10)	0	2	3	2	2	6	2	2	0
<i>Pseudomonas aeruginosa</i> (n=7)	0	5	6	4	4	7	7	7	0
<i>E. coli</i> (n=5)	0	5	5	0	0	5	2	2	0
<i>Enterobacter</i> (n=3)	1	3	3	1	1	3	0	0	0

Gen- Gentamicin, Tobra- Tobramycin, Cz- Cefazolin, PT- Piperacillin-tazobactam, AMK- Amikacin, IMP- Imipenem, CIP- Ciprofloxacin, CTX- Cefotaxim, AMP- Ampicillin, (S)- total no. of sensitive isolates.

DISCUSSION:

The percentage of samples showing positive growth in our study was 72.7%. In a study conducted by Gupta et al., the percentage of positive growth was 53%. In another study by Chandra et al., the positive samples were 72.3%. In a study conducted in the setting of Pakistan by Malik et al., the positive cultures came out to be 83%. In our study, gram-negative bacilli were more common causative agents (90%) as compared to gram-positive cocci, which were 10% of the total positive cultures. This was consistent with other researches by Chandra et al., in which the gram-negative bacilli were 85.27% and Gupta et al., in which 86.5% of the samples were gram-negative bacilli. This can be attributed to the fact that the majority of the nosocomial infections are caused by gram-negative bacteria which are more dangerous and difficult to treat. This calls for strict measures against the spread of

gram-negative bacilli, especially in the ICU setting. In our study, *Acinetobacter* (27.5%) was the most common isolate. In a study by Malik et al., conducted in Lahore, Pakistan, the commonest bacterium isolated from endotracheal secretions was *Klebsiella pneumoniae* (35.4%). Similarly, in a study by Chandra et al., *Klebsiella* (32.35%) was the most common isolate. However, in one study by George et al., *Acinetobacter* was the most common isolate (37.5%), followed by *Pseudomonas* (21.8%) and *Klebsiella* (15.6%). The rise in *Acinetobacter* in our study, especially in the ICU setup, can be attributed to the dramatic increase in the occurrence of multi-drug resistant isolates. In addition, this organism has the ability to survive in humid and dry conditions for longer periods, resulting in nosocomial outbreaks. The second most common isolate in our study was *Klebsiella* (13.1%). In a study conducted by Malik et al., in Pakistan, the most common bacterium isolated from endotracheal secretions was *Klebsiella pneumoniae* (35.4%). Another study by Chandra et al. showed *Klebsiella* (32.35%) to be the most common isolate. *Pseudomonas* was the third-most common isolate present in our study.

A study by Chandra et al. showed similar results

Among gram negative bacilli maximum resistance was noted for Cefazolin 100%, Ampicillin 97.2%, Ciprofloxacin 80.5%, Cefotaxim 80.5% followed by, Gentamicin 63.8%, Tobramycin 63.8% and Amikacin 52.7%. High sensitivity was seen for Imipenem 86.1% and Piperacillin-tazobactam 66.6%. Among gram positive organisms (Staphylococcus aureus n=2) 100% sensitivity was seen for Vancomycin. Sensitivity for Clindamycin was 50%, Erythromycin 50% and Gentamicin 75%. No isolate was sensitive to Ciprofloxacin and Cotrimoxazole. Resistance to Cefoxitin was noted in 100% of Staphylococcal isolates. This is an alarming situation as the emergence of multi-drug resistant (MDR) and extensive drug resistant (XDR) pathogens in tracheal secretions is increasing morbidity and mortality in patients, making treatment difficult and expensive. Variation in antibiotic susceptibility patterns has been noted in the studies done by various workers from the present study this can be attributed to population under study, geographical differences, institution based variation, socio economic status of the patient, local pattern of antibiotic resistance in the area, local hospital based antibiotic policy and hospital infection control practices of health care workers.

The limitation of our research included the decreased time duration of the study. Moreover, the study was carried out in a single tertiary care hospital due to which the generalization of results to the whole population cannot be carried out.

CONCLUSION

ET tube tip culture provides information in instituting early treatment protocol which should be made on the basis of antimicrobial profile to prevent mortality in Ventilator Associated Pneumonia (VAP) patients. In the present study *Acinetobacter*, *Klebsiella pneumoniae* and *Pseudomonas aeruginosa* were found to be the most frequent colonisers in mechanically ventilated patients. Most of these isolates were sensitive to Imipenem.

Further studies are needed; first, to clarify the exact role of ET colonisation in the causation of ventilator-associated pneumonia; and secondly, similar work should be undertaken at other hospitals of this region to prepare a comprehensive regional database of ET colonising bacteria and their antimicrobial resistance.

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