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MICROBIOLOGICAL PROFILE AND ANTIBIOGRAM OF MICROORGANISMS ISOLATED FROM ENDOTRACHEAL TUBE TIPS AND TRACHEAL ASPIRATES

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ABSTRACT **Introduction:** The major risk factors for nosocomial infections are excessive use of invasive devices along with weak immune system. The aim of the present study is identification of most common pathogens in endotracheal tube tips (ETT) and tracheal secretions and to study their antibiotic susceptibility pattern thereby it serves as a guidelines for empirical treatment with appropriate antibiotics. **Methods:** The present study was done in the Department of Microbiology by retrospective analysis of lab records of tracheal aspirates and ETT of patients admitted in our hospital over a period of 1 year from January 2021 to January 2022. **Results:** A total of 94 samples were collected, in which 78 were ETT samples, 16 were tracheal aspirates. Organisms isolated in 75 samples. Among 75 positive cultures, 93.3% were Gram negative bacilli, 5.3% were Gram positive cocci, remaining 1.3% yeast. Among Gram negative Bacilli, Klebsiella (53.3%) was the most common organism isolated followed by Pseudomonas aeruginosa (30.6%). Among gram positive cocci, coagulase negative Staphylococci was 5.3%. Gram negative Bacilli were highly susceptible to Carbapenems i.e.,Imipenem, Meropenem (>50%). Coagulase negative Staphylococcus showed high susceptibility to Vancomycin (75%). **Conclusion:** Gram negative Bacilli were the most frequently isolated pathogens from ETT tips and tracheal aspirates which were mostly susceptible to carbapenems and highly resistant to cephalosporins. Increasing multidrug resistance among respiratory isolated pathogens is the major concern in the present study. Culture & susceptibility pattern of these samples helps in forming antibiotic policy, thereby we can prevent ventilator associated pneumonias.

KEYWORDS : Endotracheal tube tips, tracheal aspirates, Multidrug resistance.

INTRODUCTION :

Nosocomial infections are the primary cause of mortality and morbidity among critically ill hospitalised patients. According to WHO, 5 to 7 fold higher nosocomial infections occurs in ICU's compared to others[1].

The major risk factors are excessive use of invasive devices along with weak immune system. In developing countries like India, 15% of nosocomial infections are contributed by device associated infections[2]. Due to inappropriate or prolonged use of broad spectrum antibiotics, multi-drug resistant organisms seen among hospitalised patients.

The presence of biofilm over ETT (Endotracheal tube) plays important role in pathogenesis of ventilator associated pneumonia[1]. ETT promotes the accumulation of tracheobronchial secretions by impairing the mucociliary clearance and disturbing the cough reflex .Due to insertion of ETT, injury and colonisation of tracheal mucosa with different endogenous and exogenous bacteria will be occurs. ETT acts as a bridge to transfer bacteria from oropharynx to trachea.

The aim of the present study is identification of most common pathogens in ETT and tracheal secretions and to study their antibiotic susceptibility and resistance pattern thereby it serves as a guideline for empirical treatment with appropriate antibiotics.

MATERIALS & METHODS:

The present study was done in the Department of Microbiology by retrospective analysis of lab records of tracheal aspirates and endotracheal tube tips of patients admitted in our hospital.

Duration: From January 2021 to January 2022.

Inclusion criteria: The samples obtained from patients admitted in ICU's after 48 hrs. of their admission in Government general hospital, Kakinada**.**

Exclusion criteria: Patients showing unreliability in the results of gram staining and culture characteristics.

Sample Processing:

ETT tips were collected immediately after extubation. Roughly 1cm of the distal end of ETT tip was cut for culture analysis. Tracheal aspiration done by sterile suction tube which was inserted into lower respiratory tract through a catheter. After that, samples were inoculated onto MacConkey agar and blood agar and incubated aerobically at 37^0c for 24 to 48 hrs.

Based on bacterial morphology done by Grams staining, culture characteristics and biochemical testing, the sample isolates were identified. After that antibiotic susceptibility testing done by Kirby-Bauer disc diffusion method according to CLSI guidelines on Muller-Hinton agar[3].

The antimicrobial agents used for Gram negative organisms in the present study were Amikacin(30µg), Gentamicin(30µg), Levofloxacin(5µg), Ciprofloxacin(5µg), Amoxyclav(30µg), Piperacillin–tazobactam(100/10µg), Ceftriaxone(30µg), Cefotaxime(30µg), Ceftazidime(30µg), Cefipime(30µg), Imipenem(10µg), Meropenem(10µg), Cefaperazone-sulbactam(50\50µg), Cotrimoxazole(25µg).

For Gram positive cocci, Penicillin-G(10Units), Erythromycin(15 µg), Clindamycin(2µg), Amikacin(30µg), Gentamicin(30µg), Teicoplanin(30µg), Vancomycin(30µg), Linezolid(30µg), Cefoxitin(30µg).

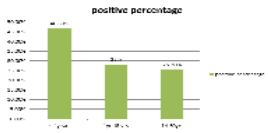
Zone diameters interpreted according to CLSI 2021 guidelines[4].

RESULTS:

A total of 94 samples were collected during the study period, in which 78(82.9%) were Endotracheal tube tip samples, 16(17%) were tracheal aspirates.

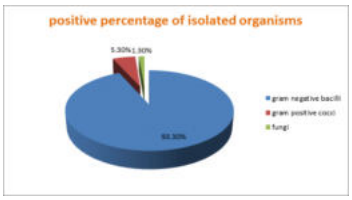
Out of 94 samples, 55(58.6%) obtained from males & 39(41.4%) from females. Organisms isolated in 75(79.7%) samples. Among 75 positive samples, 35(46.6%) isolated in infants, 21(28%) isolated in children and remaining 19 (25.3%) from adults.

Figure1:
Positivity among different age groups



Among 75 positive cultures, 70(93.3%) were Gram negative bacilli, 4(5.3%) were Gram positive cocci, remaining 1(1.3%) was yeast.

Figure:2-
Positive percentage of isolated organisms



Among Gram negative Bacilli, Klebsiella (53.3%) was the most common organism isolated followed by Pseudomonas aeruginosa (30.6%). Among gram positive cocci, coagulase negative Staphylococci (5.3%) isolated in 4 samples.

Figure 3:
Pathogens isolated from ET Tips & Tracheal aspirates.

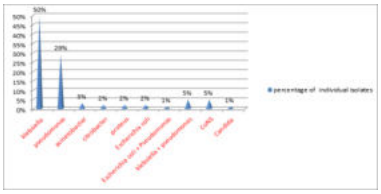


Table 1: Showing Antibiotic susceptibility pattern of isolated Gram negative bacilli

Sno	Antibiotic	Klebsiella	Pseudomonas	Acinetobacter	Citrobacter	E.Coli
1.	Amikacin	27.5%	57.1%	-	50%	100%
2	Gentamycin	32.5%	53.5%	Nil	50%	100%
3	Ciprofloxacin	61.3%	64.2%	50%	50%	50%
4	Ceftriaxone	4.5%	-	Nil	Nil	Nil
5	Cefotaxime	4.5%	-	Nil	Nil	Nil
6	Ceftazidime	-	Nil	-	-	-
7	Meropenam	65.9%	75%	50%	100%	50%
8	Imipenam	65.9%	75%	50%	100%	50%
9	Piperacillin –tazobactem	45.5%	46.4%	50%	50%	50%
10	Cefaperazone sulbactam	29.5%	28.5%	50%	Nil	Nil
11	Cefipime	-	75%	-	-	-

Table 2: Showing Antibiotic Susceptibility pattern of isolated Gram positive cocci.

Antibiotic	Coagulase negative Staphylococci
Pencillin	NIL
Erythromycin	25%
Clindamycin	NIL
Amikacin	25%
Gentamicin	25%
Teicoplanin	NIL
Cefoxitin	NIL
Vancomycin	75%
Linezolid	NIL

Klebsiella was the most common organism isolated. Klebsiella, Pseudomonas, Acinetobacter, Citrobacter were highly susceptible to Carbapenems i.e., Imipenem, Meropenem (>50%). Among all organisms, Acinetobacter showed high resistance to cephalosporin's and aminoglycosides (100%).Among Gram positive cocci, CoNS (Coagulase negative Staphylococcus) showed susceptibility to Vancomycin (75%).

DISCUSSION:

Among mechanically ventilated Intensive Care Unit patients, lower respiratory tract infections are most common .The constantly increasing antimicrobial resistance is the major concern in bacteria all over the world.

Male predominance seen among samples in the present study. This may be due to the stress in their daily working life.

Poor hand hygiene practices, prolonged stay in the hospital, poor immune status of the patient, absence of cough reflex are the important factors leading to ventilator associated pneumonia (VAP)[5].Therefore proper sample collection and culture processing can give a better results in appropriate time thereby it helps clinicians to prescribe better medication to improve clinical outcome of the patients.

In the present study, Klebsiella pneumoniae(53.3%) was the most common organism correlating with other studies by Muna Malik et al (35.4%)[6], Deepti Chandra et al(32.35%)[7], Bhaumik S et al(64.7%)[8] .Next most common organism in the present study was Pseudomonas aeruginosa (30.6%) followed by CoNS(5.3%). In other studies, Acinetobacter was the most common organism followed by Klebsiella pneumonia[1,2,9].

Gram negative bacteria are the most common organisms causing hospital acquired infections which shows more resistance to conventional antibiotics thereby treatment is difficult.

Klebsiella pneumoniae was most sensitive to Carbapenems i.e.,Imipenem(65.9%), Meropenem (65.9%), Ciprofloxacin (64.2%), Piperacillin –tazobactem (45.5%).Similarly Muhammad Irfan Malik et al [5] showed more than 50% susceptibility to Carbapenems for Klebsiella pneumoniae.

Acinetobacter showed sensitivity to Carbapenems(50%), Piperacillin-tazobactem(50%),Cefaperazone-sulbactam(50%), Ciprofloxacin(50%). In a study by Anusha et al, showed similar results[10].

In the present study, Acinetobacter showed 100% resistance to Aminoglycosides(Amikacin, Gentamicin) and Cephalosporin's (Ceftriaxone, Cefotaxime). Similar resistant pattern was seen in other studies[2].

Klebsiella pneumoniae was least sensitive to Cephalosporins (Ceftriaxone, Cefotaxime) . A study by Hassaan Ahmad, showed that Klebsiella was highly resistant to most tested antibiotics[2].

In present study, Pseudomonas was 100% resistant to Ceftazidime correlated with other studies [1].

This is a highly noticeable situation, as the multidrug resistant (MDR) & XDR pathogens in ETT tips and tracheal aspirates is increasing which results in morbidity and mortality in patients with ventilator associated pneumonia (VAP)[2].

CONCLUSION:

Gram negative Bacilli belonging to Enterobacteriaceae were the most frequently isolated pathogens from ETT tips and tracheal aspirates which were mostly susceptible to carbapenems and highly resistant to cephalosporins.The risk of acquiring infection was increasing in patients associated with other comorbidities. Increasing multidrug resistance among respiratory isolated pathogens is the major concern in the present study. We need to prescribe antibiotics in a limited manner, thereby we can prevent antimicrobial resistance to some extent.. Culture & susceptibility pattern of our ICU shall help in framing the appropriate hospital antibiotic policy, thereby we can prevent ventilator associated pneumonias. We should educate the hospital personnel as a part of infection control program & hand hygiene practices should be strictly followed.

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