

Original Research Article

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Emergence of Highly Resistant *Klebsiella* sp. in Tracheal Aspirates of Ventilated Patients in Critical Care Setup at Tertiary care Hospital in Western Rajasthan, India

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ABSTRACT

Keywords

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Patients who are mechanically ventilated are at high risk of acquiring respiratory infections due to complex interplay between the endotracheal tube, host immunity and virulence of invading bacteria. To initiate empiric antimicrobial therapy knowledge of local antimicrobial resistance patterns are essential. Objective of study were to study the causative organisms and determine the antibiotic susceptibility pattern of tracheal isolates. Endotracheal aspirates from 240 patients admitted to the ICU were cultured, identified and antimicrobial susceptibility testing was performed by standard methods. Culture showed growth in 221(92%) patients. Gram negative enteric aerobic bacteria were isolated from most of the patients. The most common being commonly isolated organism was *Klebsiella* species in 78(32.5%), followed by *Pseudomonas* in 37 (15.4%) and *Acinetobacter* 35(14.6%). Most of *Klebsiella* sp. were resistant to Cephalosporin (cefexime, cefuroxime, and ceftazidime). The antibiotics showed maximum sensitivity to *Klebsiella* sp. were imipenam and levofloxacin, followed by ciprofloxacin, aminoglycosides. (Figure 2). Gram negative organisms mostly susceptible to Carbapenem and fluoroquinolones group of antibiotics which were the predominant isolates in our critical care setup. A local antibiogram for each hospital, based on bacteriological patterns and susceptibilities is essential to initiate empiric therapy, to prevent poor outcomes and help in framing the appropriate institutional antibiotic policy.

Introduction

Patients with mechanical ventilation have an increased risk for respiratory tract infection because the tube which has been inserted into the trachea reduces the clearance of bacteria and increases the leakage of secretion around the cuff of the tube and disable the ciliary tract by damaging to it (1). Because of decreased salivary secretion,

colonization of oropharynx with Gram negative bacteria is also probable in Ventilated patients (2-3).

In the literatures, the incidence of respiratory tract infection in relation to intubation and/ or mechanical ventilation has been reported to vary between 4% and

28% and this rate has been thought to be 21 times higher than in patients without endotracheal tube (4-8).

The international study of infection in ICU which was conducted in 2007, and involved with 1265 ICUs from 75 countries, demonstrated that patients who had longer ICU stays had higher rates of infection, especially infections due to resistant *Staphylococci*, *Acinetobacter*, *Pseudomonas* species, and *Candida* species. Moreover, the ICU mortality of infected patients was more than twice that of non-infected patients. [9] Most ICU patients that acquired infections are associated with the use of invasive devices such as catheters and mechanical ventilators [10].

Prevention of the emergence and dissemination of resistant microorganisms will reduce adverse events and their attendant costs. Appropriate antimicrobial stewardship that includes optimal selection, dose, and duration of treatment, as well as control of antimicrobial use, will prevent or slow the emergence of resistance among microorganisms [11]. Therefore, the present study was designed to know the bacterial profile and determine the antimicrobial resistance pattern among patients admitted to the ICU of our institute.

Materials and Methods

This was a cross sectional study during a period of 6 months from June to Dec. 2015. Total 240 patient admitted to Trauma ICU, Medical ICU and Surgical ICU, who were on mechanical ventilation, were included in this study. The following data were collected from the patients enrolled in the study: name, age, gender etc. ETA (endotracheal aspirate) was collected by ICU doctor, using all aseptic measures using suction catheter.

All the organisms were subjected to antimicrobial susceptibility testing including detection of various resistance mechanisms like ESBL and Carbapenemase resistance by manual methods as per recent CLSI guidelines. Antibiotic discs used for gram negative organisms were Imipenem, Ciprofloxacin, Ofloxacin, Levofloxacin, Cefuroxime, Ceftriaxone, Cefexime, ceftazidime, Amikacin, Gentamycin, tobramycin. For gram positive bacteria antibiotic disk of Linezolid, Vancomycin, Imipenem, Cefuroxime, Cefexime, ceftazidime, Ciprofloxacin, Ofloxacin, levofloxacin, amikacin were used. (12)

Inclusion Criteria

Adult patients aged above 18 years, who were mechanically ventilated for various reasons.

Exclusion Criteria

HIV positive patients, Post-op ventilated patients and Sputum smear acid fast bacilli (AFB) positive patients, patients not willing to consent were excluded in our study.

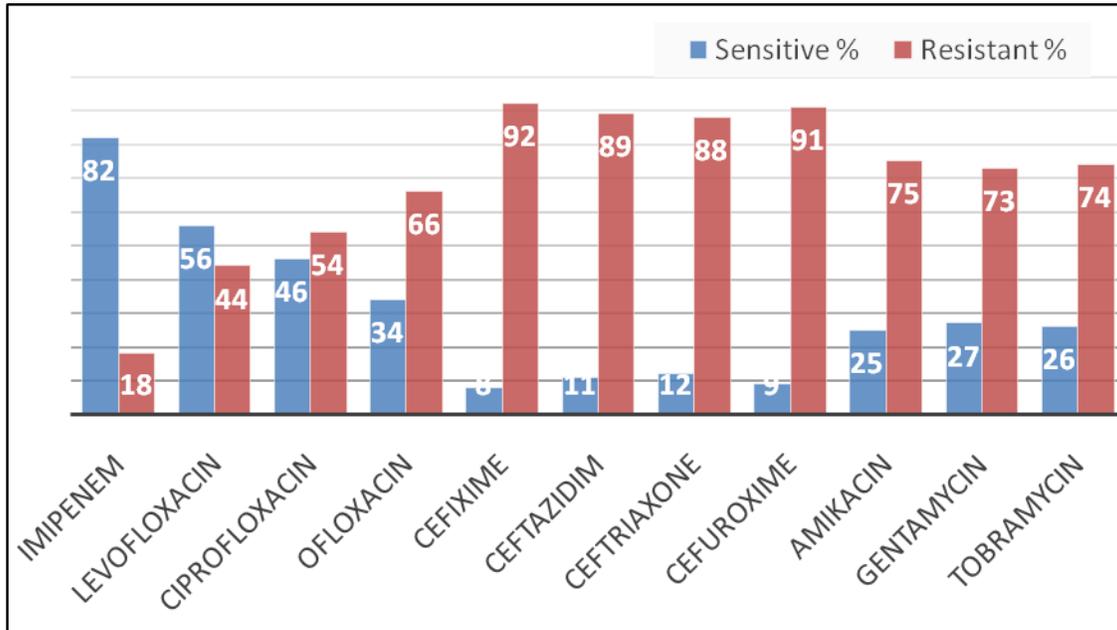
Results and Discussion

A total of 240 patients were enrolled in our study including 167(69.5%) were male and 73(30.5%) were female. Their average age was between 40-60 years. Among 240 patients, normal commensal of respiratory tract in 19(7.7%), *Candida* sp. in 8(3.3%), GPB in 7(3%) as contaminant, Gram positive cocci in 30(12.5%). The organism obtained were *Klebsiella* sp. in 78(32.5%), *Pseudomonas* sp in 37(15.4%), *Acinetobacter* sp in 35(14.6%), *Staph aureus* in 30(12.5%).

Table.1 Frequency of Organism Isolated from ICU

S. No.	Organism	Number(Percentage)
1.	<i>Klebsiella sp.</i>	78(32.5%)
2.	<i>Pseudomonas sp.</i>	37(15.4%)
3.	<i>Acinetobactor</i>	35(14.6%)
4.	<i>Esch. Coli</i>	4(1.7%)
5.	<i>Proteus sp.</i>	6(2.5%)
6.	<i>Citrobactor sp.</i>	16(6.6%)
7.	<i>Staph. aureus</i>	30(12.5%)
9.	<i>Candida sp.</i>	8(3.3%)
11.	GPB (Contaminant)	7(3.0%)
12.	Normal Throat Commensal	19(8.0%)
11.	Total (240)	

Figure.1 Patients Infected by *Klebsiella sp* and its Antibiotic Sensitivity Pattern



Klebsiella sp., were the most commonly isolated isolate present in 78(32.5%) patients among both male and females. It was almost resistant to cephalosporin. The antibiotics showed higher sensitivity to *Klebsiella sp.* were imipenam and levofloxacin, followed by ciprofloxacin.

Infections are among the most important and the leading cause of mortality and morbidity in ICU. Endo-tracheal tubes are susceptible

to infection and therefore it is important to be aware of the relevant factors and responsible organisms to take prompt action. The findings of this study would be helpful in selection of appropriate antibiotics.

In our study, GNB were most common cause of respiratory infection in ventilated patients, in which *Klebsiella sp.* is most commonly found. *Klebsiella sp.* show sensitivity to imipenam, levofloxacin,

ciprofloxacin and resistant to cephalosporin. This finding suggests that imipenem should be used judiciously in ventilated patients to prevent any further increase in resistance to carbapenem antibiotics.

Similar result found by Anusha, *et al*, 2014 was found isolates in 34(75.5%) patients. Gram negative enteric aerobic bacteria were isolated from most of the patients. The most common being *Klebsiella* species in 13 (38.23%), followed by *Pseudomonas* in 8 (23.52%), Aerobic gram positive cocci i.e., *Staphylococcus aureus* isolated in 2(5.88%) patients. Most of these organisms were susceptible to aminoglycoside and carbapenem antibiotics (13).

In contrast, Rello *et al.*,(1994) in their study have demonstrated that *P. aeruginosa* is the most common causative organism for infection of ET and this could be the result of large number of patients with chronic obstructive pulmonary disease (COPD) and long-time of intubation and even a previous history of antibiotic therapy (14). It should be noted that although there are minor variations in relative frequency of obtained organisms, different studies have reported varying sources of isolations as in our study we did report colonization of organisms into the ET tube while other studies may have considered ET-related infections in their study analysis.

Antibiotic disc sensitivity test results may vary with hospital setting, while infection rate in a hospital may depend on the hospital environment, antibiotic use and other infection control practices. All these would limit the applicability of the findings of this study to other hospital settings.

In conclusion, GNB mostly susceptible to Carbapenem and fluoroquinolones group of antibiotics which were the mostly isolates in

our ICU patients. There is an alarmingly high rate of resistance to cephalosporin's, beta lactam-lactamase inhibitors, and aminoglycoside, although imipenem is still sensitive against most pathogens but resistance is rising. To combat the high antimicrobial resistance, every centre should have a strict hospital infection control policy which includes measures like judicious use of antimicrobial agents, use of rational antibiotic therapy, education programs and hand hygiene.

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