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International Journal of Current Research
Vol. 7, Issue, 07, pp.18125-18129, July, 2015

INTERNATIONAL JOURNAL OF CURRENT RESEARCH

ISSN: 0975-833X

RESEARCH ARTICLE

ANTIBIOGRAM OF BACTERIAL ISOLATES FROM TRACHEAL ASPIRATE OF ICU PATIENTS AT TERTIARY CARE HOSPITAL IN WESTERN, RAJASTHAN, INDIA

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ARTICLE INFO

Article History:
Received 20th April, 2015
Received in revised form
09th May, 2015
Accepted 15th June, 2015
Published online 31st July, 2015

Key words:

ICU,
Endotracheal Aspirates,
Microbes.

ABSTRACT

Introduction: Respiratory infections in critically ill patients are associated with high morbidity and mortality. 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.

Materials and Methods: This study was based on 245 patients of ICU of M.D.M. hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan, India. Patients with positive endotracheal aspirates were included in this study. Data regarding microbial isolates and their culture and sensitivities were recorded.

Results: The organism obtained were Klebsiella sp, Staph. aureus, Pseudomonas sp, Acinetobacter sp, Citrobactor, E.coli, Proteus Whereas Klebsiella sp, were the most frequently isolated bacteria. All the organisms more or less showed both sensitive and resistance pattern but Acinetobacter sp was show resistant to all the antibiotics except imipenam and levofloxacin.

Conclusions: Gram negative organisms mostly susceptible to fluoroquinolones&Carbapenem 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.

Citation: Soni Priyanka, Parihar, R. S., Khatri, P. K., Soni laxman Kumar, Agarwal Ramesh, Duggal Swati and Verma Shashikala, 2015. "Antibiogram of bacterial isolates From, Tracheal aspirate of ICU patients at tertiary care hospital in western, Rajasthan, India", *International Journal of Current Research*, 7, (7), 18125-18129.

INTRODUCTION

Antibiotic resistance is a major world-wide problem in the intensive care unit (ICU), including in India. It has been realized that the spread of drug resistant organisms in the ICU is related to the widespread use of broad spectrum antibiotics. The rate of antimicrobial resistance in the ICU is several folds higher than in the general hospital setting. Many surveillance efforts have drawn attention to this phenomenon. (Jones *et al*., 2004; Bronzwaer *et al*., 2002; Hadi *et al*., 2008; Vincent *et al*., 2009). ICU is one of potential sources of nosocomial infections even in countries where extensive infection control measures are routinely implemented. 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. Most ICU patients that acquired infections are associated with the use of invasive devices such as catheters and mechanical ventilators (Shulman *et al*., 2005). 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 (Shlaes *et al*., 1997). 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.

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Aim of the study

1. To study the culture and sensitivity characteristics of endotracheal aspirate obtained from patients on mechanical

ventilation in ICU of our institute for proper selection of antibiotic.
2. To frame an institution based local antibiotic policy for our future use.

MATERIALS AND METHODS

This project was carried during a period of 4 months from January to April 2015 in the department of microbiology, M.D.M. hospital, Dr. S.N. Medical College, Jodhpur, Rajasthan. Patient admitted to MDM Trauma ICU, Medical ICU, Surgical ICU and CCU, who were on mechanical ventilation, were included in this study. From the ICU, 245 tracheal aspirates were studied. The following data were collected from the patients enrolled in the study: name, age, gender etc. (endotracheal aspirate) was collected by using all aseptic measures by ICU Doctor.

Semi-quantitative culture was performed based on the four quadrant streak technique using a calibrated loop. At first sample was taken by inoculating loop and a well was made on the agar plate, then four quadrant were made by streaking from well. Each specimen was streaked onto MacConkey agar and 5% sheep blood agar. Plates were incubated at 37°C for 24 hours. After 24 hours ETA cultures were read semi-quantitatively by observing the growth in the four quadrants, which suggested the approximate number of colony forming units per ml (CFU/ml) of the bacteria in the specimen. Various biochemical tests were performed in order to measure the viability of biochemical behaviour among the strains. According to the manual of methods for general bacteriology by American society of Microbiology, several biochemical tests i.e. Triple Sugar Iron (TSI) Test, Citrate Utilization Test, Motility Indole, Urease (MIU) Test, Oxidase Test, Catalase Test, and Coagulase Test were performed to identify bacteria of interest. After isolation and identification, sensitivity of selected organisms against different antibiotics was studied according to CLSI guidelines. Antibiotic discs used for gram negative organisms were Imipenem, Amikacin, Cefuroxime, Cefexime, Ceftazidim, Ciprofloxacin, Ofloxacin, Gentamycin, levofloxacin, tobramycin. For gram positive bacteria antibiotic disk of Linezolid, Vancomycin, ampicillin, amoxyclav, Imipenem, Amikacin, Cefuroxime, Cefexime, Ciprofloxacin, Ofloxacin, levofloxacin were used. (Clinical and Laboratory Standards Institute (CLSI) 2011)

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

During the four month of study periods, 245 tracheal aspirates from ICU admitted patients were enrolled. Among them 177(72.24%) were male and 68(27.75%) were female. (Figure 1) Their average age was between 40-60 years. Among 245 patients, normal commensal of respiratory tract in 19(7.7%), candida sp. in 8(3.3%), GPB in 7(2.85%) as contaminant, Gram positive cocci in 32(13%) and gram negative bacilli in 179(73%) patients (Figure 2). The organism obtained were Klebsiella sp. in 100(40.8%), Staph.aureus in 32(13.06%), Pseudomonas sp in 28 (11.42%), Acinetobacter sp in 25(10.2%), Citrobactor in 16(6.53%), candida sp in 8(3.26%), E.coli in 5(2%), Proteus in 5(2%) patients (Figure 3). Klebsiella sp, were the most frequently isolated bacteria found in 100(40.8%) patients. Here for 7 organisms 15 types of antibiotics disks were uses for sensitivity. Here most of the antibiotics showed resistance except imipenam and levofloxacin.

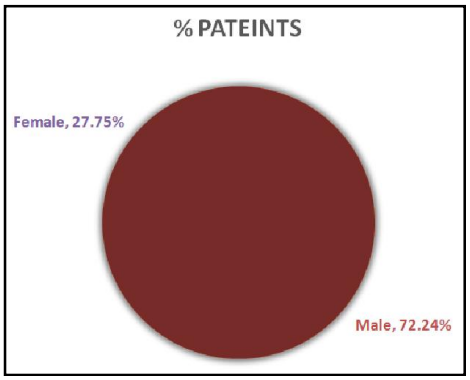

Figure 1. Gender Comparison of Patients

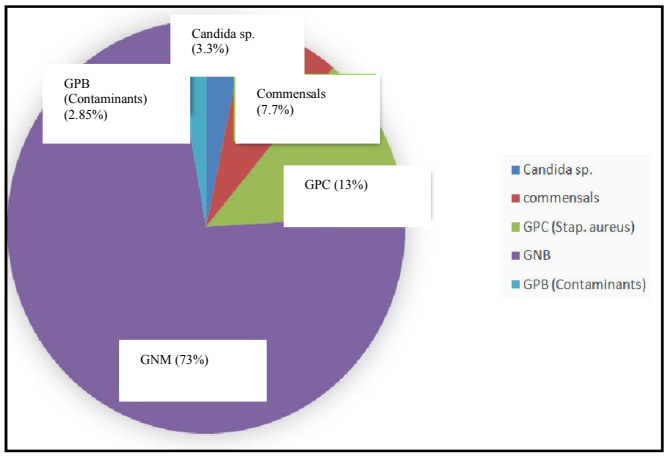

Figure 2. Microorganism Isolation from Tracheal culture

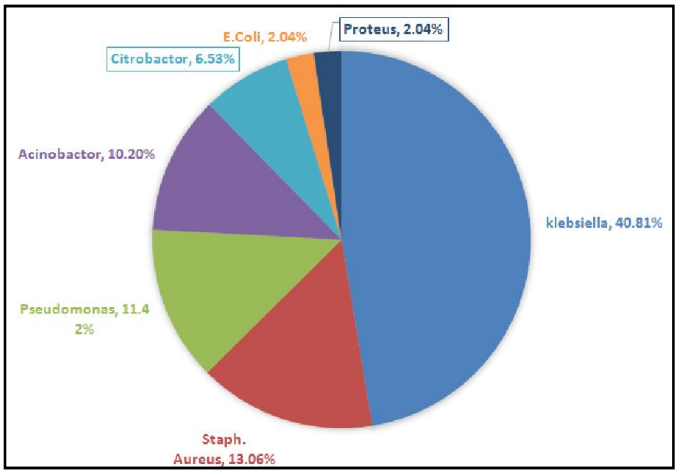

Figure 3. Microorganism Isolation from Tracheal culture

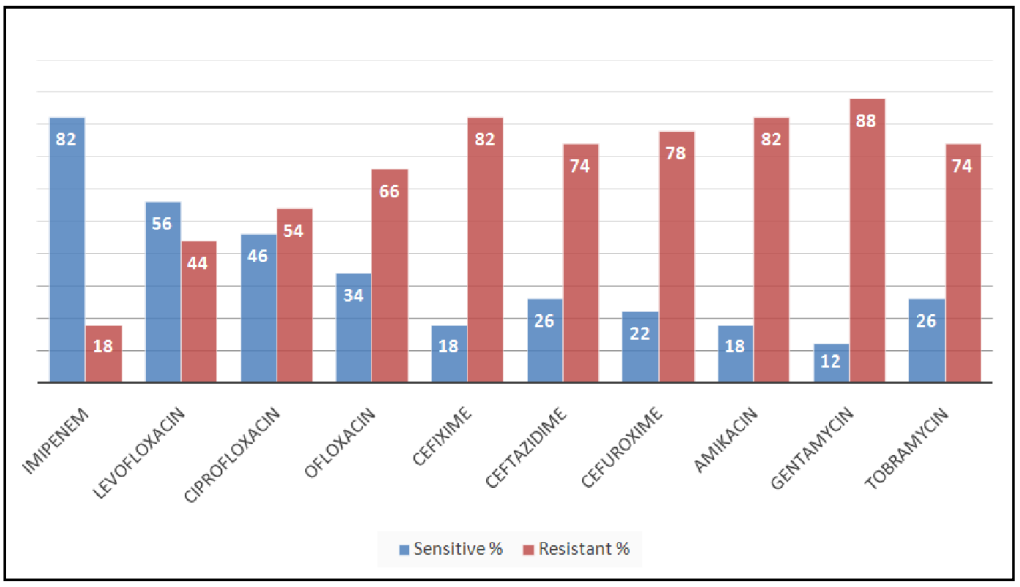

Figure 4. Patients Infected by Klebsiella sp and its Antibiotic Sensitivity Pattern

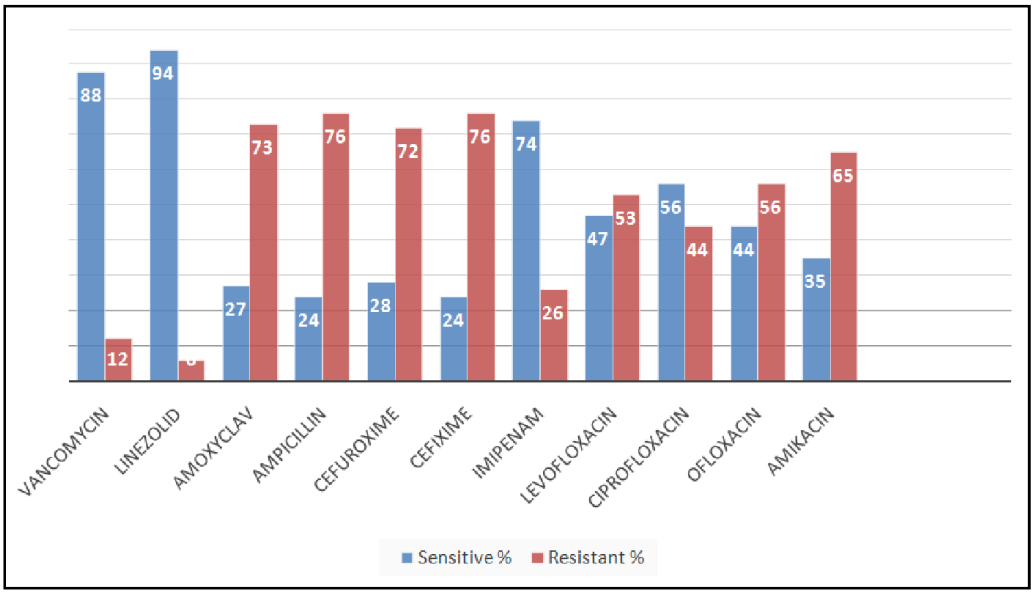

Figure 5. Patients Infected by Staph. Aureus and its Antibiotic Sensitivity Pattern

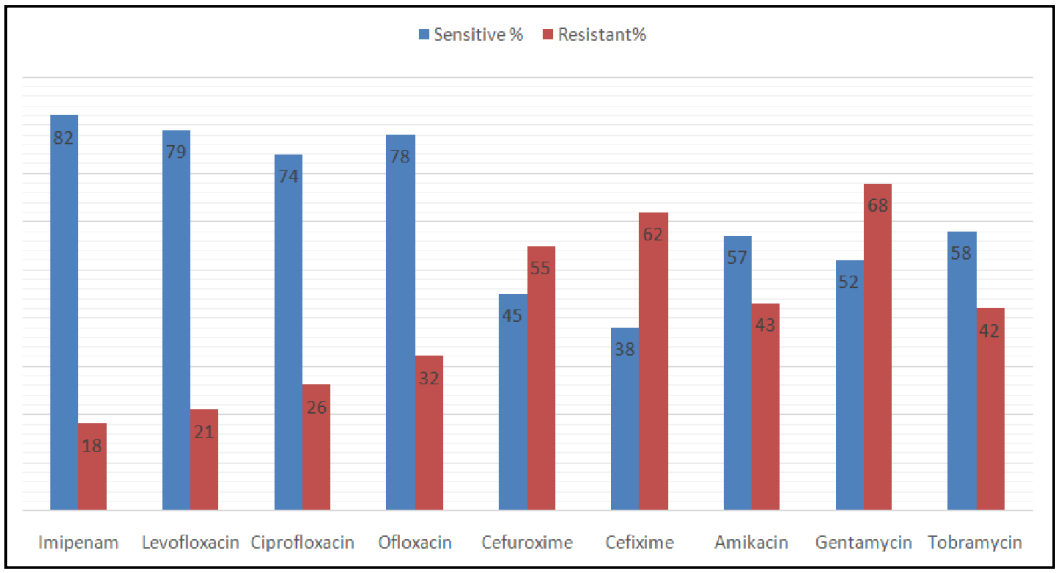

Figure 6. Patients Infected by Pseudomonas sp and its Antibiotic Sensitivity Pattern

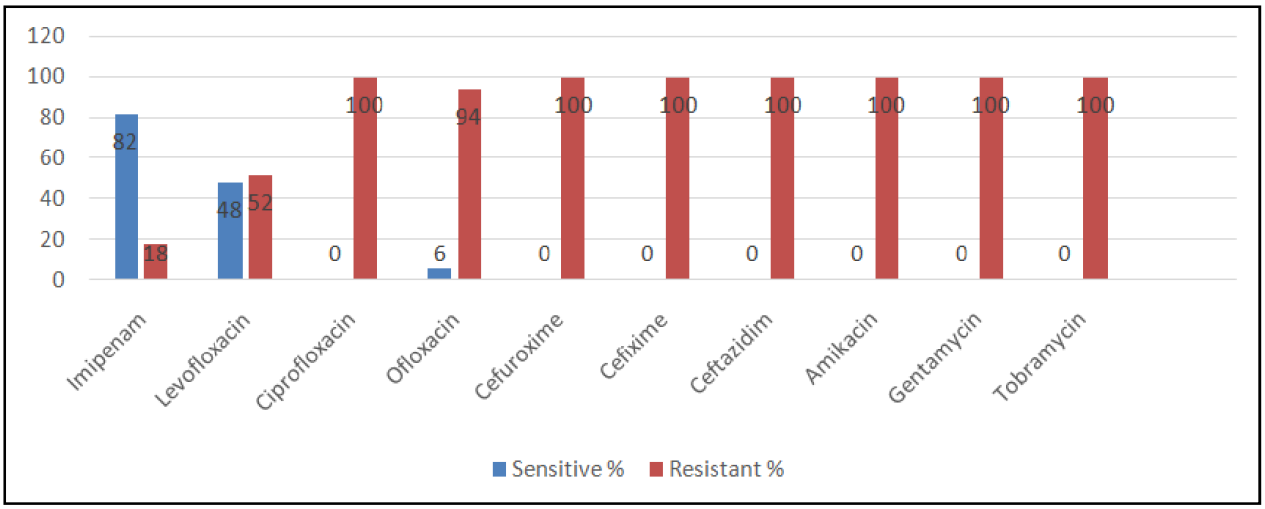

Figure 7. Patients Infected by Acinetobacter sp. and its Antibiotic Sensitivity Pattern

Generally most of the patients are admitted with diseases like pulmonary failure, stroke, kidney failure or asthmatic attack. Among all age, the male patients are found to be higher in number. From the findings it was observed that the antibiotic cephalosporin (Cefexime, cefuroxime, and ceftazidime) is most resistant to the organism klebsiella sp. and Acinetobactor. Among all applied antibiotics except imipenam and levofloxacin were resistant for Acinetobactor (Figure 7). This is very alarming for the patients infected with Acinetobacter sp. The antibiotics showed maximum sensitivity to Klebsiella sp. (most frequently isolated bacteria) were imipenam and levofloxacin, ciprofloxacin followed by Aminoglycisides and cephalosporin (Figure 4).

In average, all the antibiotics are sensitive for the infected patients with pseudomonas sp. The antibiotics imipenam, flouroquinolones has good sensitivity pattern followed by Aminoglycisides than cephalosporin (Figure 6). In case of the patients infected by the organism Staph. aureus antibiotics that are most sensitive are linezolid, vancomycin, followed by imipenam, flouroquinolones, amikacin whereas amoxyclav, ampicillin, cephalosporin showed increased resistance (Figure 5)

DISCUSSION

Antimicrobial agents (AMs) are among the most commonly used drugs in hospitalized patients. The emergence of AM resistance in ICUs is of great concern as it increases the likelihood of drug interactions/side effects and cost of therapy due to use of newer antibiotics. Resistance may also be responsible for prolonged hospital stays and can affect prognosis. The problem of resistance in a hospital is difficult to understand without the knowledge of AM use pattern. (The impact of antimicrobial, 1997) In our study we found that GNB were most common cause of respiratory infection in ICU patients, in which Klebsiella sp. is most commonly found. Klebsiella sp. show sensitivity to imipenam, levofloxacin, ciprofloxacin followed by Aminoglycisides and cephalosporin. Acinobactor show resistant to all the applied antibiotic except imipenam and levofloxacin. GPC, also isolated from ICU infection, in which Staph. aureus is most common microorganism, which were sensitive to linezolid, vancomycin followed by imipenam, flouroquinolones. This finding suggests that imipenem should be used judiciously in ventilated patients to prevent any further increase in resistance to imipenem. 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.

Conclusion

Gram negative organisms mostly susceptible to fluoroquinolones and Carbapenem group of antibiotics which were the predominant isolates in our critical care setup. 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. Judicious use of older and newer antimicrobial agents is essential to prevent the emergence of multi drug resistant bacteria in the ICU. 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.

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