IOSR Journal of Dental and Medical Sciences (IOSR-JDMS)
e-ISSN: 2279-0853, p-ISSN: 2279-0861.Volume 15, Issue 8 Ver. X (August. 2016), PP 40-48
www.iosrjournals.org

The Incidence of Device Associated Infections, Causative Microorganisms And Antibiotic Sensitivity Pattern in Icu

Dr Prabhakar S Jirvankar[1],Dr Dhiraj Gambhire[2]
[1]*Associate Professor, Department Of Medicine, Government Medical College,Aurangabad, INDIA*
[2]*Medical Director,Immuno Oncology Atpfizer,Greaterboston*

Abstract: *Hospital acquired infections are infections that are neither present nor incubating when a patient enters hospital[1]. Despite progress in public health and hospital care, infections continue to develop in hospitalized patients, and may also affect hospital staff.[2] About nine per cent of inpatients have a hospital acquired infection at point of time.[(3)] Their effects vary from discomfort, functional disability and emotional stress to prolonged or permanent disability . Small proportion of patient deaths each year are primarily attributable to hospital acquired infections [(2,3)]. The economic costs are considerable. The increased length of stay for infected patients is the greatest contributor to cost.[2]*

The development of a surveillance process to monitor this rate is an essential first step to identify local problems and priorities, and evaluate the effectiveness of infection control activity. Surveillance, by itself, is an effective process to decrease the frequency of hospital-acquired infections.[2,5]

This study was undertaken as a part of surveillance system for MICU to find out incidence of device associated infection rate, causative microorganisms and their antibiotic sensitivity pattern. In this study the attack rate of catheter associated Urinary Tract Infection was 52.63% and incidence of 83.33% per 1000 catheter days. Most common organisms isolated were Klebsiella (63.63%,) E-Coli (31.81%) and Pseudomonas (4.54%). Eighty one percent of Klebsiella isolates, 76.47% of E. Coli isolates and 87.5% of Pseudomonas isolates were resistant for antibiotics tested. Out of total isolates tested, 58.82% were resistant to Gentamycin, 100% isolates were resistant to Ampicillin and Cefotaxim, 80% were resistant to Ciprofloxacin, 87.5% were resistant to Sulphamethaxazole and 42.10% were resistant to Furantoin.

Keywords : *Catheter, Device, Hospital, ICU, Mortality, Resistance,*

I. Introduction

Hospital acquired infections are infections that are neither present nor incubating when a patient enters hospital[1]. Despite progress in public health and hospital care, infections continue to develop in hospitalized patients, and may also affect hospital staff.[2] About nine per cent of inpatients have a hospital acquired infection at any one time.[(3)] Their effects vary from discomfort, functional disability and emotional stress for the patient to prolonged or permanent disability and a small proportion of patient deaths each year are primarily attributable to hospital acquired infections [(2,3)]. The economic costs are considerable. The increased length of stay for infected patients is the greatest contributor to cost.[2]

The most frequent nosocomial infections are infections of surgical wounds, urinary tract infections and lower respiratory tract infections. The WHO study, and others, has also shown that the highest prevalence of nosocomial infections occurs in intensive care units and in acute surgical and orthopedic wards.[2]

Hospital-acquired infection is more common in ICU because of the severity of illnesses of the patients there, decreased immunity among patients, the need for multiple interventions such as intravascular catheterization creating potential routes of infection, intubation etc. The heavy dependence of patients such that there is considerable contact with doctors, nurses and others during emergencies, and the transmission of drug-resistant bacteria among crowded hospital populations, where poor infection control practices may facilitate transmission.[2,4]

The proportion of days spent in the ICU in which the patient's treatment included invasive devices is increasing, in fact 25–50% of nosocomial infections are due to combined effect of the patient's own flora and invasive devices . Catheter-associated urinary tract infection (UTI), Central line-associated bloodstream infection (BSI), Ventilator-associated pneumonia (VAP) are among leading causes of mortality and morbidity among ICU patients.[1,4]

The nosocomial infection rate in patients in a facility is an indicator of quality and safety of care. Not all hospital acquired infections are preventable, since the very old, the very young, those undergoing invasive procedures and those with Suppressed immune systems are particularly susceptible.

It is believed that about 30 per cent of hospital acquired infections could be avoided by better application of existing knowledge and realistic infection control practices [(3)]. The development of a surveillance process to monitor this rate is an essential first step to identify local problems and priorities, and evaluate the

effectiveness of infection control activity. Surveillance, by itself, is an effective process to decrease the frequency of hospital-acquired infections.[2,5]

This study was undertaken as a part of surveillance system for MICU to find out incidence of device associated infection rate, causative microorganisms and their antibiotic sensitivity pattern.

Impact of nosocomial infections –

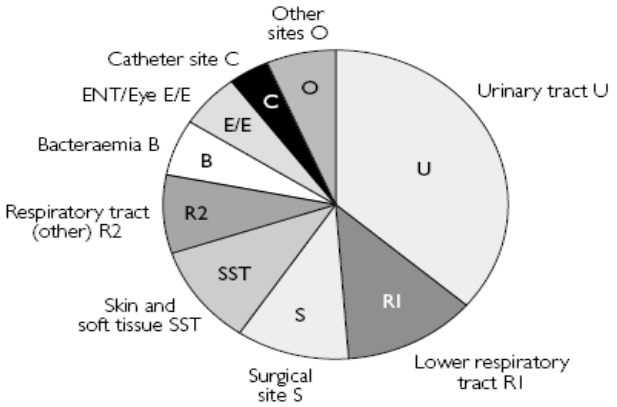
With modernization of Medicine and increased frequency of invasive monitoring, diagnostic and therapeutic procedures incidence of hospital acquired infections is greatly increased. It is causing significant burden on economy and resources. In USA it is estimated that nosocomial infections affect more than 2 million people, costing $4.5 billion, and contribute to 88 thousand deaths annually [(1)].In a prevalence survey conducted by WHO in 55 hospitals of 14 countries representing 4 WHO Regions (Europe, Eastern Mediterranean, South-East Asia and Western Pacific) showed an average of 8.7% of hospital patients had nosocomial infections. At any time, over 1.4 million people worldwide suffer from infectious complications acquired in hospital.[1] As per the report of the management and control of hospital acquired infection in acute NHS trusts in England about 9% of in patients have hospital acquired infection at any one time, equivalent to at least 1,00,000 infections a year. The cost of treating hospital acquired infection may be as much as £1,000 million each year[3] . No such data at national level is available for India.

The advancing age of patients admitted to health care settings, the greater prevalence of chronic diseases among admitted patients, and the increased use of diagnostic and therapeutic procedures which affect the host defenses will provide continuing pressure on nosocomial infections in the future. Organisms causing nosocomial infections can be transmitted to the community through discharged patients, staff, and visitors. If organisms are multiresistant, they may cause significant disease in the community.[2,3,6]

Definition – A nosocomial infection — also called "hospital acquired infection" can be defined as:

1. An infection acquired in hospital by a patient who was admitted for a reason other than that infection.[2]
2. An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission. This includes infections acquired in the hospital but appearing after discharge, and also occupational infections among staff of the facility.[2]

Common Nosocomial infection sites - An example of the distribution of sites of nosocomial infections is shown in the figure



Adapted fom Enquête nationale de prévalence des infections nosocomiales, 1996. *BEH*, 1997, 36:161–163.

II. Causative Microbial Factors

The patient is exposed to a variety of microorganisms during hospitalization. Contact between the patient and a microorganism does not by itself necessarily result in the development of clinical disease, other factors influence the nature and frequency of nosocomial infections. The likelihood of exposure leading to infection depends partly on the characteristics of the microorganisms, including resistance to antimicrobial agents, intrinsic virulence, and amount (inoculum) of infective material.[1,2,6] Many different bacteria, viruses, fungi and parasites may cause nosocomial infections. Infections may be caused by a microorganism acquired from another person in the hospital (cross-infection) or may be caused by the patient's own flora (endogenous infection). Some organisms may be acquired from an inanimate object or substances recently contaminated from another human source (environmental infection). Before the introduction of basic hygienic practices and antibiotics into medical practice, most hospital infections were due to pathogens of external origin (food borne and airborne diseases, gas gangrene, tetanus, etc.) or were caused by microorganisms not present in the normal

flora of the patients (e.g. diphtheria, tuberculosis). Progress in the antibiotic treatment of bacterial infections has considerably reduced mortality from many infectious diseases. Most infections acquired in hospital today are caused by microorganisms which are common in the general population, in whom they cause no or milder disease than among hospital patients.

III. Common organisms

A) Staphylococcus Aureus : S. Aureus can cause a wide spectrum of diseases such as wound infections, abscesses, sepsis, pneumonia and toxic shock syndrome etc. The bacteria has maintained its position as the leading pathogenic organism in the ICU and caused up to 30% of the ICU acquired infections. S. Aureus is one of the commonest pathogens in late –onset VAP and there is an increasing trend all over the world of methcillin resistant clinical isolates i.e.MRSA. Several studies have shown an increased cost and excess length of stay in VAP caused by MRSA.

B) Coagulase negative staphylococci: Staphylococci epidermidis, the most important pathogen among the CoNS are reported to be the third most common causative agent of nosocomial infections and the most frequent cause of nosocomial bloodstream infections. CoNSis a part of the normal skin microflora but can also colonize the nasal mucosa, the lower airways and invasive devices. CoNS infections pose a serious problem especially among immunocompromised patients and are often difficult to treat since CoNS strains are commonly multiresistant.

2. Enterococci :

The excessive and wide spread use of cephalosporins during the last few decades has increased the importance of the enterococci in the clinical setting, especially in nosocomial infections. The group included Enterococcus faecalis, Enterococcus faecium, Enterococcus durans and Enterococcus avium, where the former two are of greatest clinical importance in the ICU setting. E.faecalis is by far the most frequently isolated species, but the prevalence of the more resistant E.faecium has increased and could be a result of the increased use of carbapenems. Thus, enterococci is a group of bacteria that with their inherent tolerance against unfavorable conditions, renders them prone to survive for long periods in the hospital setting even on dry surfaces and accordingly, further facilitate transmission between patients.

3. Enterobacteriacae :

These opportunistic pathogens include amongst others Escherichia coli, Klebsiella spp and Enterobacter cloacae which are all part of the normal flora in the large bowel. It is implicated as cause of VAP from 4% to 23% in various studies. They may cause infections, mainly urinary tract infection (UTI) and pneumonia, following antibiotic treatment, as they are often resistant to first –line treatment such as amoxicillin.

3. Pseudomonas aeruginosa :

This is one of the commonest pathogens causing ventilator associated pneumonia (VAP), especially late onset VAP. It is implicated as cause of VAP from 5% to 31% in various studies. This non-fermentative gram –negative rod is often multi-resistant and can survive for long periods on equipment in patient's surroundings. Cross-infection does occur but endogenous infection is probably more common through the use of broad-spectrum antibiotics that select for resistant strains.

4. Acinetobacter Spp. :

These gram-negative coccobacilli can survive for long periods in a dry environment and are often intrinsically resistant to many antibacterial agents. They often colonize the respiratory tract and wound and are a special threat in burn units. Outbreaks can be difficult to control and there are case reports where entire ICUs have been forced to close due to such outbreaks. Risk factors for acquiring these strains are emergency procedures and previous antibiotic use, especially fluoroquinolones.

5. Candida species :

Fungal infections are an increasing problem in hospitals during the last decade, especially in the ICU setting which has emerged as epicenters for infections such as candidaemia and invasive candida infection (ICI). The escalating problem in ICUs is probably due to an increasing population of immune-compromised patients. The risk for fungal infection is increased by several risk factors that are frequently occurring among ICU patients, such as colonization with Candida spp, on haemodialysis, use of invasive medical devices, parenteral nutrition and recent extensive abdominal surgery. Candida spp. is the fourth most common isolates amongst nosocomial bloodstream infections and the third amongst ICU-acquired IVD-related bloodstream infections.

IV. Antimicrobial Drugs Commonly Used In The Icu

Despite the importance of infection control measures we will never be able to prevent all infections and proper antibiotic use will always be one of the cornerstones when saving lives in patients. De-escalation therapy, i.e. to start with a broad spectrum antibiotic when the infecting organism is unknown, and administrate the drug after the cultures have been obtained and then narrow the spectrum as soon as the results of the microbial cultures are known. Thus, a knowledge concerning antibiotic agents and their antimicrobial spectrum is essential to every physician that works in the ICU. A strict antibiotic policy is very important and narrow spectrum agents are desirable, but patients have often been exposed to several antibiotics before admission to the ICU. So, in reality there is large use of broad-spectrum antibiotic in the ICU, yet, an active policy with a daily reconsideration and evaluation of the antibiotic treatment is crucial.

Risk factors for ICU-acquired infections

The main risk factors can be divided into three key groups that related to patient characteristics and underlying diseases, related to the acute disease process and related to the use of invasive diagnostic or therapeutic procedures. Underlying diseases can impair host defense mechanisms, predisposing to the development of ICU infection. Patients on immunosuppressive medication, older patients and patients with malnutrition are at an increased risk. These endogenous risk factors are hard to influence by preventive methods.

V. Aims And Objectives Of The Study:

1. To study incidence of device associated infections at medical Intensive Care Unit [MICU] of a tertiary care teaching hospital.
2. To study causative microorganisms of device associated infections and their antibiotic sensitivity pattern.
3. To study relation between incidences of device associated infection and mortality.
4. To study pattern of antibiotic use in Intensive care.

VI. Material And Methods

Study Design and Subjects:

The present study was undertaken at Government Medical College and Hospital, Aurangabad which is a tertiary level teaching hospital. The study was prospective, observational study. All adult patients admitted to Medical Intensive Care Unit [MICU] and fulfilling inclusion criteria were included. Patients admitted in MICU were primarily requiring intensive care for non coronary medical causes.

Inclusion Criteria:

- Patients admitted to Medical Intensive Care Unit [MICU] with at least one invasive device in situ (Urinary Catheter, Endotracheal / Tracheostomy Tube, Central Line).
- Minimum 24 hours stay in Medical Intensive Care Unit [MICU].

Data Collection:

All the patients satisfying inclusion criteria were recorded for demographic profile – Name, Age, Sex, Date of admission, Registration number, Length of MICU stay and Clinical diagnosis. Data also noted for co-morbid conditions like Diabetes, Use of steroids, Malignancy and Immunocompromised status as in the Proforma.

Antibiotic history noted in the form of number of antibiotics used and it's duration. Patient with device in situ were monitored for presence of infection on admission, appearance of new infection, presence of clinical symptoms, other laboratory parameters and radiological parameters for presence of infection.

New infections were monitored with serial samples for respective device. Catheterized patients were monitored with urine routine microscopy and culture sensitivity on admission and every 4^{th} day. Clinical data noted in the form of Symptoms of UTI like Fever, Dysuria, Urgency, Supra pubic tenderness and Urine Microscopy for bacteria and pus cells. Intubated patients monitored with respiratory secretions microscopy and culture sensitivity every 3^{rd} day. Other data noted was Ventilator day, Symptoms of fever, Cough, purulent sputum, CBC, and new infiltrate on x ray chest.

Collection of Samples :

1. Method of Collection of Respiratory Secretions: Patients were ventilated for 1 min with 100% oxygen and then a suction canula was passed into an endotracheal or Tracheostomy tube. 1 ml of secretions was aspirated using negative suction. The first sample was discarded and second one sent to laboratory immediately for analysis. Samples were collected similarly on subsequent days.
2. Method of Collection of Urine Samples: The urine samples were collected directly into sterile collection bulb.

Data Analysis:
Data was analyzed using Microsoft Excel and SPSS software. Appropriate statistical tests applied wherever necessary.

The definitions used for diagnosis of Respiratory Tract Infection and Urinary Tract Infection were taken according to Center for Disease Control (CDC) USA.[8]

1. Respiratory Tract Infection – Clinical and Laboratory Criteria, for any patient.

At least one of the following :
- Fever (38°C or 100.4°F) with no other recognized cause
- Leucopenia (<4,000 WBC/mm3) or leucocytosis (>12,000 WBC/mm^3)

And at least two of the following :
- New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions, or increased suctioning requirements.
- New onset or worsening cough, or dyspnea, or tachypnea.
- Rales or bronchial breath sounds.
- Worsening ABG (e.g., O2 desaturations, PaO2/FiO2 <240], increased oxygen requirements)

2. Urinary Tract Infection: urinary tract infection must meet at least one of the following criteria:
- Patient has at least one of the following signs or symptoms with no other recognized cause: fever (38^0C), urgency, frequency, dysuria, or Suprapubic tenderness and
- Patient has a positive urine culture, that is, 10^5 microorganisms per mm^3 of urine with no more than two species of microorganisms.

3. Asymptomatic bacteriuria - asymptomatic bacteriuria must meet at least one of the following criteria:
- Patient has had an indwelling urinary catheter within 7 days before the culture and
- Patient has a positive urine culture, that is, $>10^5$. Microorganisms per mm^3 of urine with no more than two species of microorganisms and patient has no fever ($>38^0$ C), urgency, frequency, dysuria, or Suprapubic tenderness.

VII. Observations

This is prospective observational study conducted at Medical Intensive Care Unit [MICU] at Government Medical College Aurangabad. The present study comprised of 57 patients who fulfilled the criteria for inclusion. The following observations were noted.

Table–1 : Age and Sex distribution of patients in study group

Age group	Male	Female	Total
12-20	6	4	10
21-30	6	5	11
31-40	3	6	9
41-50	6	7	13
51-60	2	5	7
61- above	4	3	7
Total	27	30	57

Patients were equally distributed in all age group with maximum number in 21-50 ages. Number of male and female patients was nearly equal.

Table – 2: Diagnosis of patients on admission

Diagnosis at admission	No.of patients	Percentage
Organophosphrous Compound Poisoning	19	33
Cerebrovascular Accident	6	10.6
Snake Bite	5	8.8
Renal Failure	4	7
Hepatic Encephalopathy	3	5.3
Severe Malaria	3	5.3
Septicemia	3	5.3
Dengue Fever	2	3.5
Unknown Poisoning	2	3.5
Other	10	18
Total	57	

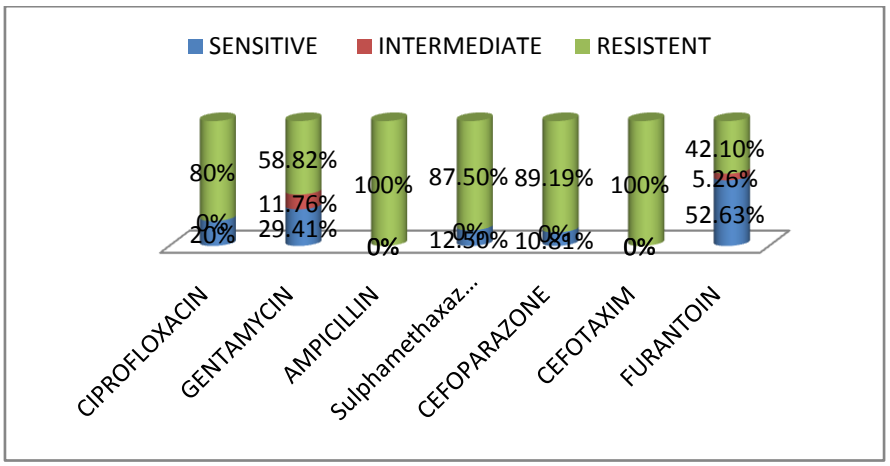


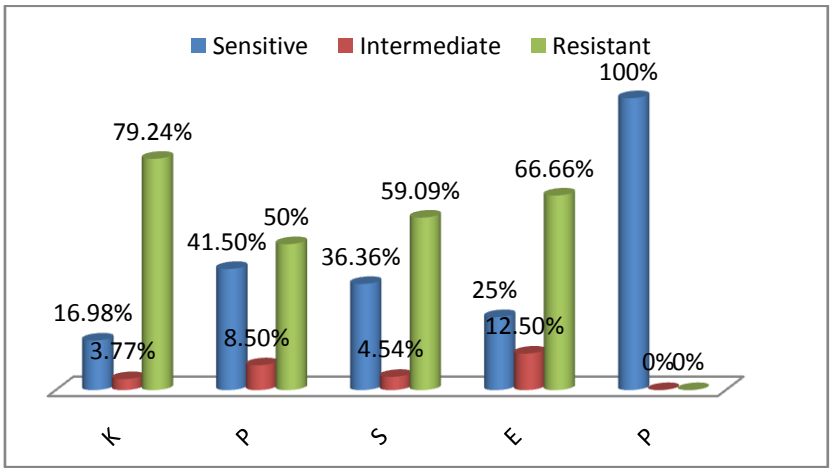
Figure – 2 : Sensitivity Pattern of various Antibiotics for Urinary Tract Isolates

Out of 51 isolates , 15 (29%) were sensitive to Gentamycin, 30(58.82%) were resistant. For Furantoin out of 19 isolates 10(52.63%) were sensitive, 8(42.10%) were resistant. Ampicillin (tested on 43 samples) and Cefotaxim (tested on 10 samples) shows 100% resistance.

Table – 3 : Incidence of Respiratory Tract Infection

Total No. of intubated Patients	24
Total No. of Intubated Days	180
Total No. of New Infections	17
Attack Rate	70.83%
Incidence of Respiratory Tract Infection in Intubated Patients	94.44%

24 patients out of 57 were intubated with cuffed portex endotracheal tube or Tracheostomy tube. Total number of intubated days was 180. Total number of new respiratory tract infection observed during this period was 17 and attack rate was 70.83%. The incidence of respiratory tract infection in intubated patients was 94.44% per 1000 intubated days.



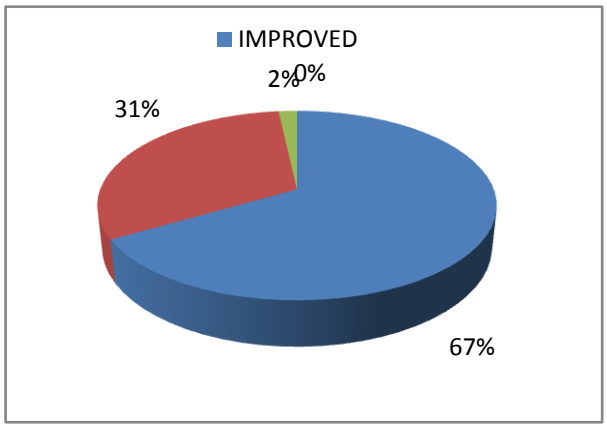
Figure–4: Antibiotic Sensitivity Pattern of Isolates In Respiratory Tract Infection

Table – 4 : Outcome of intubated patients

	Expired	Improved
Patients with infection	10/17 (58.82 %)	7/17 (41.17 %)
Patients without infection	3/7 (42.85 %)	4/7(57.14 %)

Table shows mortality higher 58.82% in infected group as compared 42.85% in non infected group, it is found to be statistically insignificant Chi-Square value 0.51 and P value > .05 (0.4755).

Fig 1-Overall Outcome of patients : Overall outcome of patients irrespective of diagnosis and other confounding factors. Out of 57 patients 38(67%) patients improved, 18(31%) patients died and 1(2%) went against medical advice [AMA] which could not be followed.



Figure–5: Outcome of the patients

VIII. Discussion

The strengths of this study are the prospective design and the systematic search for various infections on admission and during the MICU stay. During the study period, we tried to register all infections even more systematically. The study was conducted in MICU where only adult non cardiac critical patients are treated. This may increase the relative number of infections treated in the study MICU by excluding coronary patients and elective postoperative patients, who are unlikely to have infections on admission. Hence, the results may not be generalized to more specialized ICUs, but the results can be regarded as reliable and applicable to medical ICUs. Furthermore, the spectrum of infections needing MICU treatment would have been different if patients with MICU stay < 24 hours had also been included.[7] The time frame of more than 24 hours' ICU stay may cause selection bias towards very seriously ill patients and overestimation of mortality. Critically ill patients who may have died within 24 hours have not been included in the study, which is likely to change the mortality data. We have also not included post operative patients requiring ICU care as there is separate surgical ICU. This might have changed the observations and results of present study. Definitions of infections published by CDC were used. The WHO and NNIS system has recommended the expression of ICU acquired infections per 1000 device days, to facilitate comparisons between units and hospitals.[2,8]

Table – 5 : Causative Microorganisms in Catheter Associated Urinary Tract Infection

Study	Year	Microorganisms Isolated			
		Klebsiella	E- Coli	Pseudomonas	Other
Kashmir Study[8]	2004	7.72%	90.12%	0.31%	1.85%
Banglore Study[11]	2002	9.01%	43.84%	18.71%	28.35%
Present Study	2008	63.63%	31.81%	4.54%	0%

Most common isolate in present study was Klebsiella (63.63%). While in other studies most common isolate was E-Coli, Kashmir Study (90.12%), Banglore Study (43.83%)). Other isolates in present study were E-Coli (31.81%) and Pseudomonas (4.54%).

Table – 6 : Resistance of Urinary Tract Isolates to Commonly Used Antibiotics

Study	Antibiotics Tested					
	Cipro	Genta	Ampi	Cefo-taxim	Sulphamethoxazole	Furo-ntoin
Kashmir Study[8]	89.7%	83.3%	-	-	98%	91%
Present Study	80%	58.8%	100%	100%	87.50%	42.10%

In present study resistance of urinary tract isolates to Cefotaxim and Ampicillin was 100% which is consistent with frequent use of these antibiotics in MICU. High sensitivity found to Gentamycin and Furontoin.

Table – 7 : Causative Microorganisms in Intubated Patients.

Study	Year	Microorganisms Isolated (%)				
		Kleb-siella	Pseudo-monas	Staph A.	E-Coli	Proteus
Banglore Study[10]	2002	19	21.5	9	12.4	3.5
EPIC Study[8]	1996	8	29	30	-	-
Sourabh Bhave Study[12]	2006	39.2	17.07	21.9	2.44	-
Present Study	2007-2008	38.46	30.76	19.23	7.69	3.84

Most common isolate in Respiratory Tract Infection was Klebsiella (38.46%) which is comparable with previous studies in our set up.

Incidence of Nosocomial Infection and Association with Mortality

In present study there was no definitive relationship between incidence of device associated infection and mortality. P value for correlation between incidence of Urinary Tract Infection and mortality was > 0.05(0.4492) and P value for correlation between incidence of Respiratory Tract Infection and mortality was > 0.05(0.4755). In the study carried out by Dutch Surveillance System in multivariate regression developing a device associated infection was not associated with mortality [(18)]. In study carried out by Pekka Ylipalosaari[(7)] there was significant association between incidence of hospital acquired infection and morbidity, hospital stay but no significant effect of hospital acquired infection was found on long term survival.

IX. Summary And Conclusion

The present prospective observational study carried out in MICU at Government Medical College Aurangabad. The purpose of the study was to throw light on incidence of Device Associated Infection in our set up and to obtain data of antibiotic use, common microorganisms and their antibiotic sensitivity pattern. Patients with different demographic characteristics and diagnosis admitted to MICU with at least one invasive device and minimum 24 hour MICU stay were included in the study. Patients were monitored serially for evidence of infection as per WHO monitoring guidelines. Standard protocols were used for sample collection and laboratory processing. Standard definitions used as per CDC guidelines.

The attack rate of catheter associated Urinary Tract Infection was 52.63% and incidence of 83.33% per 1000 catheter days. Most common organisms isolated were Klebsiella 63.63%, E-Coli 31.81% and Pseudomonas 4.54%. These organisms were subjected for sensitivity testing to the antibiotics Ciprofloxacin, Gentamycin, Ampicillin, Cefotaxim, Cefoperazone, Furantoin and Sulphamethaxazole. 81% of Klebsiella isolates, 76.47% of E. Coli isolates and 87.5% of Pseudomonas isolates were resistant for antibiotics tested. Out of total isolates tested, 58.82% were resistant to Gentamycin, 100% isolates were resistant to Ampicillin and Cefotaxim, 80% were resistant to Ciprofloxacin, 87.5% were resistant to Sulphamethaxazole and 42.10% were resistant to Furantoin.

The attack rate of Respiratory Tract Infection in intubated patients was 70.83% and incidence of 94.44% per 1000 intubation days. Most common organisms isolated were Klebsiella 38.46%, Pseudomonas 30.76% and Staph Aureus 19.23%. These organisms were subjected for sensitivity testing to the antibiotics Ciprofloxacin, Gentamycin, Ampicillin, Cefotaxim, Cefoperazone, Amoxyclav and Sulphamethaxazole. 79.24% of Klebsiella isolates, 50% of Pseudomonas isolates and 59.09% of Staph Aureus isolates were resistant for antibiotics tested. Out of total isolates tested 65.38% were resistant to Gentamycin, 100% isolates were resistant to Ampicillin, 75% were resistant to Cefotaxim, 42.11% were resistant to Ciprofloxacin, 61.12% were resistant to Sulphamethaxazole and 66.66% were resistant to Cefaperazone, 63.63% were resistant to Amoxyclav.

Out of 57 patients studied more than 2 antibiotics were used in 26% of patients. Most commonly used antibiotic were Cefotaxim 25.33% and Ampicillin 20.63%. It was difficult to comment whether the organism developed resistance to antibiotic to which it was sensitive initially or different strain was involved in subsequent infection.

Statistically significant association was not found between device associated infection and mortality. Mortality was primarily affected by diagnosis on admission.

This study shows higher incidence of device associated infections at MICU, as well the higher resistance to commonly used antibiotics. There is need of a study with larger sample size and with risk factor analysis for locating the cause for higher incidence and to suggest improvement measures.

References

[1]. Robert A. Weinstein. Hospital Acquired Infections, Harrisons Principals of Internal Medicine. 16th Edition, Vol. 1, p.775-781.

[2]. A practical guide - Prevention of hospital-acquired infections 2nd edition, WHO/CDS/CSR/EPH/2002.12. World Health Organization, Department of Communicable Disease, Surveillance and Response. This document has been downloaded from the WHO/CSR Web site. See http://www.who.int/emc for more information.

[3]. The Management and Control of Hospital Acquired Infection in Acute NHS Trusts in England. Executive summary and recommendations. Report by the Comptroller and Auditor General LONDON: The Stationery Office, HC 230 Session 1999–00. Published on 17 February 2000.

[4]. CDC- Monitoring Hospital Acquired Infections to Promote Patient Safety, United States, 1990-1999. CDC weekly report published on March 03, 2000/ 49(08); 149-153.
[5]. Lee, Terrie B. RN, MS, MPH, CIC, Chair; Baker, Ona G. RN, MSHA, CIC, Vice Chair; Lee, James T. MD, PhD; Scheckler, William E. MD; Steele, Lynn MS, CIC; Laxton, Christopher E. Recommended Practices for Surveillance. Special Communication. AJIC : American Journal of Infection Control. 26(3):277-288, June 1998.
[6]. Farokh Erach Udwadia, Principals of Critical Care, Second Edition 2005. Page 394 – 412.
[7]. Pekka Ylipalosaari, Infections In Intensive Care; Epidemiology And Outcome. Academic dissertation presented, with the assent of the Faculty of Medicine of the University of Oulu, for public defence in Auditorium 1 of Oulu University Hospital, on May 25th, 2007, at 12 noon Oulun Yliopisto, Oulu 2007.
[8]. Manzoor Kadri, Guidelines for Prevention of Nosocomial Pneumonia CDC weekly morbity and mortality report. January 3, 1997/ Vol.46 /No. RR-1.
[9]. K D Tripathi. Essentials of Medical Pharmacology Pharmacology. 5th Edition, page 627-698.
[10]. Arjana Tambic Andraševic, Tera Tambic, Smilja Kalenic, and Vera Jankovic, and the Working Group of the Croatian Committee for Antibiotic Resistance Surveillance. Surveillance for Antimicrobial Resistance in Croatia Emerging Infectious Diseases, Vol. 8, No. 1, January 2002.
[11]. SN Wadhwa Consultant Urologist, Sir Ganga Ram Hospital, New Delhi, Formerly Head, Dept. of Urology, AIIMS, New Delhi Overcoming Catheter-Associated UTI.
[12]. Saurabh Bhave. A Study Of Ventilator Associated Pneumonia, Dissertation For Md Medicine, Babasaheb Ambedkar Marathwada University Aurangabad. July 2006.