Research Article

Prevalence of nosocomial infections in the intensive care unit

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ABSTRACT

Background: ICU patients are at risk for acquiring nosocomial infection. The present study is to define, underlying disease, severity of illness, of nosocomial infections in ICU patients .Patients hospitalized in the ICU's are 5 to 10 times more likely to acquire nosocomial infections than other hospital infections. The frequency on infections at different anatomic sites and the risk of infection vary by the type of ICU. The main objective of research is to study the prevalence of nosocomial infections in the ICU and to find out the predominant organism causing.

Methods: A total of 100 cases developing infection after 48 hours after admission into intensive care unit were studied. Study design – Prospective study for one year. Sample size – 100 cases will be included in the study with detailed history, physical examination and required lab investigations. Results will be analysed statistically.

Results: Among 100 patients who had nosocomial infections in the ICU, (28)28% had UTI, (22) 22% LRTI, (20)20% CRBSI, (16)16%Soft tissue infections & (14) 14% had Pneumonias. Among 14 cases of Pneumonias 10 were associated with VAP. This study also reveals that 62(79.48%) were due to device related and 16(20.51%) were non device related. Gram negative aerobes were the predominant organisms isolated in this study and appropriate antibiotic were substituted on Culture sensitivity reports. The mean age of the patients was 46.22 years ranging from (21 to 80 years), there were 66 males (66%) and 34 females (34%) in this study. Out of 50 patients, 16 (32%) were on ≥2 antibiotics. The mean days of use of antibiotics were 10 days. Mean days of stay in ICU was 6.42 days. Out of 100 patients, 22 (22%) had DM, 48(48%) had HTN and 30(30%) had related Co-morbidities.

Conclusions: NIs is seen worldwide but is less studied and are given less emphasis in developing countries. This study reports various types of Nosocomial Infections in the ICU set up. The relatively high incidence of NI observed in this study may be a reflection of the higher severity of illness, poor nutritional status, more interventions poor handling by staff and possibly poor adherence to aseptic measures. The ICU of low resource country may have to cope up with patients with severe illness coupled with lack of resources and expertise and control the nosocomial infection.

Keywords: NI, LRTI, CRBSI, E COLI

INTRODUCTION

An intensive care unit or ICU is a specialized section of the hospital that provides comprehensive and continuous care for persons who are critically ill and who can benefit from treatment. Intensive care has been shown to benefit patients who are severely ill and medically unstable – that is, they have a potentially life threatening disease or disorder. Common equipment in an intensive care includes mechanical ventilators to assist breathing through an endotracheal tube or a tracheostomy; monitoring equipment; intravenous lines for drug infusions, fluids or total parenteral nutrition; nasogastric tubes, suction pumps, drains and catheters; and a wide array of drugs including ionotropes, sedatives, broad spectrum antibiotics and analgesics. Hospital-acquired (nosocomial) infections are defined as those not present or incubating at the time of admission to the hospital.

Nosocomial infections are estimated to affect >2 million patients, cost $4.5 billion, and contribute to 88,000 deaths in U.S. hospitals each year. In recent years, nosocomial infections have become even more problematic because of increased numbers of immune compromised patients, increasing antibiotic resistance in pathogenic bacteria, increased rates of fungal and viral super infections, and increased numbers of invasive procedures and invasive devices.[1] ICU patients are at risk for acquiring nosocomial infection. The present study is to define, underlying disease, severity of illness, of nosocomial infections in ICU patients.[2] Patients hospitalized in the ICU's are 5 - 10 times more likely to acquire nosocomial infections than other hospital infections. The frequency

on infections at different anatomic sites and the risk of infection vary by the type of ICU.[3]

Infection control measures have important implications for daily practice, because the number of patients already colonized or infected with MDR organisms on arrival to the ICUs is increasing.[4]

METHODS

This study was conducted at DR.B.R. Ambedkar Medical college and hospital, K.G.Halli, Bangalore. A total of 100 cases developing infection after 48 hours after admission into intensive care unit were studied form 2013-2014.

Table 1: Diagnostic criteria for nosocomial infection.

Nosocomial infection	clinical features	lab features
Urinary tract infection	fever lower abdominal pain change in urine parameters	leukocytosis positive urine culture (10^5 CFU per ml of urine)
Lower respiratory infection	fever cough/sputum decreased breath sounds, crepts	leukocytosis sputum for Gram stain changes in fresh x-ray
Catheter related infections	un explained fever/chills pain tenderness at site of insertion of CVP/IV lines	leukocytosis positive blood culture positive catheter culture
Skin & soft tissue infections	pain, swelling, tenderness of skin, fever, purulent drainage	leukocytosis positive swab culture
Pneumonias	fever chest pain decreased breath sounds intensity, rales	leukocytosis sputum for gram stain positive sputum culture positive X-ray

Detailed history along with physical examination will be done for each patient. Study design was Prospective study for one and half year. Sample size was of 100 cases will be included in the study with detailed history, physical examination and required lab investigations. Results will be analyzed statistically. Patients who are admitted in intensive care unit and then developed infection and who stayed for more than 48 hours were included .Patients already harboring infection and admitted in intensive care unit and patients transferred from another hospital or intensive care unit were excluded in this study. Haemogram with blood indices, ESR, RBS, Urine Routine, ECG, Chest X-Ray, Blood urea/creatinine, LFT, Serum, electrolytes, Urine Culture Sensitivity, Blood Culture Sensitivity, Catheter tip Culture Sensitivity, CSF analysis (where indicated), ET tube tip Culture Sensitivity, Sputum test (AFB, Gram stain, Culture Sensitivity), Pus Culture Sensitivity were

done. The media commonly used will be blood Agar, Mac conkey's Agar, Brain heart infusion broth for all culture sensitivities. Fastidious organisms will be done on Muller Hington Agar. Cultures were done where clinically indicated. Based on bio -chemical properties pathogens will be identified. Collection of samples will be done in aseptic precautions.

RESULTS

A total of one hundred (100) patients, admitted in ICU of Dr B.R Ambedkar Medical College and Hospital were studied. Pathogens isolated from different nosocomial infections were studied. The individual bacterial isolates and their sensitive pattern to various antibiotics were also recorded.Among the pathogens isolated E coli was the predominant organism isolated (Table 2).

Table 2: Pathogens isolated in various nosocomial infections.

Organism	Uti	Lrti	Crbsi	Soft tissue infection	Pneumonia
E.coli	8(28.6%)	-	-	-	-
Klebsiella	6(21.4%)	-	-	-	-
Pseudomonas	6(21.4%)	-	-	-	-
Streptococcus	-	-	-	-	4(28.6%)
Enterobactor	-	-	2(10%)	-	-
Staph.aureus	-	-	2(10%)	-	5(35.71%)
Gm–ve aerobes	-	-	6(30%)	10(62.5%)	3(21.42%)
Acinetobacter					2(14.2%)
Unidentified	8(28.4%)	-	10(50%)	6(37.5%)	-
Total	28(28%)	22(22%)	20(20%)	16(16%)	14(14%)

Urinary tract infection(28%) was the commonest nosocomial infection to be found in the ICU, followed by LRTI(22%),Catheter related infections (20%). Soft tissue infections (16%) and pneumonias (14%) as shown in Table 3 and Figure 1.

Table 3: Distribution of various nosocomial infections.

Nosocomial infections	No of patients	Percentage
Urinary tract infections	28	28%
Lower respiratory infections	22	22%
Catheter related infections	20	20%
Soft tissue infections	16	16%
Pneumonias	14	14%
Total	100	100%
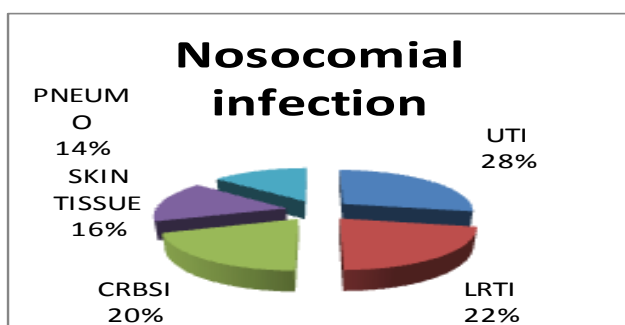
Figure 1: Distribution of various nosocomial infections.

We also found that 62(79.48%) were due to device related and 16(20.51%) were non device related (Table 4).

DISCUSSION

In this study it has been found that among 100 patients who had nosocomial infections in the ICU, (28)28% had UTI, (22) 22% LRTI, (20)20% CRBSI, (16)16% Soft tissue infections & (14) 14% had Pneumonias. Among 14 cases of Pneumonias ,10 were associated with VAP. This is similar to study conducted by Chaitali Pattanayak et al in eastern India which showed UTIs the predominant cause of nosocomial infections(54.9%).[5]

Most of the patients were on atleast one invasive device.Approx 71.42% of the patients used long term urinary catheters,71.42%used mechanical ventilation. This was similar to study conducted in Brazil .[6]

Gram negative aerobes were the predominant organisms isolated in this study which was found to be similar in a study conducted by Keshni Naidu et al.[7] Gram negative aerobes were the predominant organisms isolated in this study and appropriate antibiotic were substituted on Culture sensitivity reports. The mean age of the patients was 46.22 years ranging from (21 to 80 years), there were 66 males (66%) and 34 females (34%) in this study. Out of 100 patients 32 (32%) were on ≥2 antibiotics. The mean days of use of antibiotics were 10 days. Mean days of stay in ICU was 6.42 days . Out of 100 patients, 22(22%) had DM, 48(48%) had HTN and 30(30%) had related Co-morbidities.

Observations of the study were made. Risk factors for Urinary tract infections were prolonged duration of catheterization, Diabetes mellitus, Female sex, Microbial colonization of urinary drainage bag, per urethral colonization with potential uropathogens, Errors in catheter care. Risk factors of pneumonia were Duration of stay in ICU, By 10th day over half of ICU patients had or pharyngeal colonization, Patients receiving antibiotics develop gram negative colonization more rapidly, Prophylactic use of PPI's, antacids,H2-blocker has been considered a risk factor for gram negative colonization. Risk factors for Catheter related blood stream infections were improper technique for venous/arterial lines, Poor aseptic precautions before catherization, Poor low quality catheters(catheters without impregnated chlorhexidine & silver sulfadiazine), Duration of catheter in situ for longer days

Table 4: Device related nosocomial infections.

Type of NI	Type of Device	Infection with device	Infection without device
UTI (28)	Catheter	20(71.42%)	8(28.57%)
Pneumonia(14)	On ventilator	10(71.42%)	4(28.57%)
CRBSI(20)	All types	18(90%)	2(10%)
Others (16)	-	14(87.5%)	2(12.5%)
Total (78)		62(79.48%)	16(20.51%)

NIs is seen worldwide but is less studied and are given less emphasis in developing countries. This study reports various types of Nosocomial Infections in the ICU set up. The relatively high incidence of NI observed in this study may be a reflection of the higher severity of illness, poorer nutritional status, more interventions, fewer staff and, possibly, poor adherence to aseptic measures. The ICU of low resource countries may have to cope with patients with severe illness coupled with the lack of resources and expertise needed to control NI.

Decreasing ICU stay duration and patient days on intervention are important for reducing the incidences of NI. Ten to 30 per cent of patients admitted to hospitals and nursing homes in the country acquire nosocomial infection as against an impressive five per cent in the West, according to members of Hospital Infection Society (HIS), India. This alarming situation is attributed to hospitals' reluctance to invest in infection control, lack of awareness and improper waste management. The invariable outcome is antibiotic intake costing between Rs 3,000 to Rs 5,000 a day, prolonged hospital stay and loss of work, which affects the health of the economy too. In a few instances, nosocomial infection (urinary, blood stream, surgical wound or respiratory infection) leads to septicemia having a mortality rate of 80 per cent. Suggestions to strengthen the infection control programme is turned down by the management of most hospitals as spending on infection control does not generate revenue. Ideally, to prevent nosocomial infection, there should be more space per bed, special air handling provisions for clean air without recirculation, hand wash area, special anti-bacterial methods of flooring, air curtains, isolation wards, positive air zones and hand wash area outside each bed in the ICU. Each hospital should devise its own infection control guidelines depending on the facilities available. "The guidelines should be modified from time to time." Surveillance and constant monitoring is necessary along with educating the staff about infection control practices. The infection control committee should have participation from surgeons, physicians, microbiologists, technicians, nurses, ward boys and housekeeping staff. The role of microbiologists is significant in this context. "As many skin barriers are transgressed in the form of IV lines, urinary tract catheters central lines used in specialized ICU exist infection control is the only way in which a check can be kept on infection and in all this microbiologists has an important role to play. Washing hands before touching the patients is crucial in checking nosocomial infection. To minimize transmission of microorganisms from equipment and environment, adequate method of cleaning, disinfecting and sterilization should be made, every visitor has to use the hand rub solution before entering the ICU. Taking of foot wear also becomes important, but many follow the western concepts using foot wear in ICU. One is exposed to more dust while taking off the footwear. Many studies suggest if the floor is cleaned more than twice a day, removing footwear is not so necessary.

CONCLUSION

NIs is seen worldwide but is less studied and are given less emphasis in developing countries. This study reports various types of Nosocomial Infections in the ICU set up. The relatively high incidence of NI observed in this study may be a reflection of the higher severity of illness, poor nutritional status, more interventions poor handling by staff and possibly poor adherence to aseptic measures. The ICU of low resource country may have to cope up with patients with severe illness coupled with lack of resources and expertise and control the nosocomial infection. Recommendations from this study to reduce the burden of Nosocomial infections are as follows, Appropriate care in ICU by strict hand washing, dressing and glove precautions, Confirmation of Nosocomial infections, Appropriate treatment of co morbid conditions, Prophylactic use of antibiotics should be avoided in absence of clear indication, Antibiotics should be tailored once culture data become available, Aseptic measures during invasive measures and training of health care providers, Adequate dosing and De-escalation, Differentiate true bacterial infection from simple colonization, Judicious use of antibiotics as Very few antibiotics are in the pipe line, to develop 1 antibiotic it takes 10 yrs with all the trials, We do not have NEWER antibiotics in the next 5 years.

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