



## A STUDY ON NOSOCOMIAL INFECTION IN INTENSIVE MEDICAL CARE UNIT- INCIDENCE, PATTERN AND ETIOLOGY

### Medicine

**Dr. R. Ramaraj** MD (General Medicine), Assistant Professor, Department of General Medicine, Government Medical College & Esi Hospital, Coimbatore, Tamilnadu, India.

**Dr. N. Senthilrani\*** MD (General Medicine), Assistant Professor, Department of General Medicine, Government Medical College & Esi Hospital, Coimbatore, Tamilnadu, India. \*Corresponding Author

### ABSTRACT

**OBJECTIVE:** To find the incidence and etiological agents of nosocomial infection in those patients admitted in Intensive Medical Care Unit in tertiary care hospital.

**METHODS:** This was a hospital based prospective study done over 200 patients.

**RESULTS:** The age of patients admitted in Intensive Medical Care Unit (IMCU) was between 13 years and 85 years. Most patients were above 40 years of age (63%). The most common age group was between 40 to 50 years (22.5%) and it was equally distributed between male and female. The incidence of nosocomial infection in this study is 8%. The commonest infection was urinary tract infection followed by respiratory tract infection and blood stream infection. Klebsiella was the most common organism followed by Escherichia coli and pseudomonas aeruginosa. Urinary tract infection was caused mostly by klebsiella, Escherichia coli and pseudomonas. Respiratory infection was caused by klebsiella and pseudomonas. Blood stream infection was caused by klebsiella. Out of 16 patients with nosocomial infection 4 had diabetes mellitus (25%). Urinary tract infection was seen in 2 diabetics (18%) and 9 non-diabetics (8%). Out of the 4 patients with respiratory infection one was a diabetic (25%). Blood stream infection was seen in only one patient who was diabetic.

**CONCLUSION:** The incidence of nosocomial infection in patients admitted in IMCU was 8% in the study population and the commonest infection was urinary tract infection followed by respiratory tract infection and blood stream infection. Gram negative bacteria especially klebsiella was the predominant organism. All patients who had nosocomial infection were above 40 years. Old age patients were more susceptible than young patients and found no significant difference in incidence between male and female patients.

### KEYWORDS

Nosocomial infection, urinary tract infection, respiratory tract infection, blood stream infection.

### INTRODUCTION

Healthcare-associated infection or Nosocomial Infection are defined as infections not present and without evidence of incubation at the time of admission in hospital settings and clinically evident after 48 hours of hospitalization. Infections that occur after the patient is discharged from the hospital can be considered healthcare-associated if the organisms were acquired during the hospital stay<sup>1</sup>.

The incidence of nosocomial infection ranges from 7 to 10%<sup>2</sup>. In hospitals the incidence of infection is highest in Intensive care units (ICU) than in other wards. The comorbidities and use of invasive devices leads to increased risk of infections in ICU patients. In developing countries the incidence of device related nosocomial infection is high in ICU<sup>3</sup>. According to Extended Prevalence of Infection in Intensive Care (EPIC II) study, the presence of ICU related infections is mounting up to 51%<sup>4</sup>. Nosocomial infections are caused by different pathogens. The common infections are ventilator associated pneumonia, central line infections, and urinary infections<sup>5</sup>. Nosocomial infections are associated with an increased mortality rate, extended duration of hospital stay and increased hospital expenses<sup>6</sup>.

### AIM OF THE STUDY

- To find the incidence of Nosocomial infection in those patients admitted in Intensive Medical Care Unit in Tirunelveli Medical College Hospital
- To find the etiological agents in such infections
- To determine the incidence of specific type of nosocomial infection.

**Selection criteria:** All patients admitted in IMCU in Tirunelveli Medical College Hospital for more than 48 hours.

### Total number of patients under study - 200

**Period of study:** All the patients admitted as inpatients in Intensive Medical Care Unit in Tirunelveli Medical College Hospital, during the period of September 2012- November 2013 were included in this study.

**STUDY DESIGN:** Prospective study.

**Geographic distribution:** Geographic distribution of the patients was predominantly from rural areas of Tirunelveli, Tenkasi, Tuticorin districts.

### Exclusion criteria:

- All patients admitted in IMCU for less than 48 hours.
- Patients with evidence of sepsis at admission.
- Patients with proven pre-existing infection.

### Limitation of the Study:

Repeated cultures could not be performed in IMCU as patients were shifted to medicine ward.

### METHODOLOGY:

All the patients were asked a thorough and detailed history and general and systemic examination were done. Incidence, rate of infection, also known as cumulative incidence rate method was used to measure the frequency of new cases of nosocomial infection.

As indicated by researches, the nosocomial infection incidence rate was nearly zero in the first day of admission, significantly raised as the time went on.

After careful clinical examination of the patients all were submitted to the following investigations.

### BASIC LAB INVESTIGATIONS:

- Complete Blood Count
- Blood Sugar, Urea, Creatinine
- Liver function test
- Urine analysis

### CULTURE

- URINE
- SPUTUM
- BLOOD
- STOOL

All the culture samples were delivered to laboratory in a sterile manner immediately.

### RESULTS AND OBSERVATION

**Relation between age and infection:**

The total number of patients included in the study was 200 during the period of 2012-2013 in Tirunelveli Medical College and Hospital.

**TABLE 1: Age and Infection distributions**

Agegroup	Cases	
	No	%
Up to 20years	19	9.5
21-30years	29	14.5
31-40years	26	13.0
41-50years	37	18.5
51-60years	45	22.5
61-70years	34	17.0
>70yrs	10	5.0
Total	200	100
Range	13-80 years	
Mean	46.0 years	
SD	17.30years	

The mean age of admission of patients in IMCU was 46 years.37% patients were below 40 years of age and 63% of patients were above 40years.

**TABLE 2: Sex distribution**

Sex	Cases	
	No	%
Male	114	57
Female	86	43
Total	200	100

Total male patients were 114 and female patients were 86 in this study. 57% of the patients were male and 43% were female.

**Risk factors:**

Out of the 200 patients in our study 30 patients had previous history of hypertension and 42 patients had previous history of diabetes out of which 12 patients had both.

**TABLE: 3**

Column 1	Column 2
Diabetes	42
Hypertension	30
Both diabetes and hypertension	12
Total patients	200

**TABLE: 4 Diabetes and Nosocomial Infection:**

Diabetes patients with nosocomial infection	4
Diabetes patients with no nosocomial infection	38
Total diabetic patients	42

Out of 42 diabetic patients 4 had nosocomial infection which is around 10%.

**TABLE: 5**

Risk factor	Number of patients
DM	4
NON DM	12
Total	16

Out of 16 patients with nosocomial infection 4 were diabetic.

**TABLE 6: Relation between UTI and Diabetes Mellitus**

Risk factor	Number of patients
DM	2
NON DM	9
Total	11

In our study there were 11 cases of Urinary tract nosocomial infection. Out of these only 2 patients were diabetic. This amounts to 18% of the patients with UTI.

**TABLE: 7**

Risk factor	Number of patients
DM	2
NON DM	40
TOTAL	42

Out of 42 diabetics only 2 patients had UTI. This is 5% of the patients with UTI.

**TABLE 8: Respiratory Nosocomial infection and Diabetes Mellitus**

Risk factor	Number of patients
DM	1
NON DM	3
Total	4

4 patients out of 200 had respiratory tract infection. Among these 4 patients one patient was a diabetic. 25% of the patients with respiratory infection had diabetes mellitus.

**TABLE 9: BLOOD STREAM INFECTION AND DIABETES MELLITUS**

Infection	Number of patients
Blood infection	1
No blood infection	41
Total	42

Out of 42 diabetic patients only one had blood stream infection. This was 2% of the infection.

**TABLE: 10**

Risk factor	Number of patients
DM	1
NON DM	0
TOTAL	1

In this study only one patient had blood stream infection who was a diabetic.

**TABLE: 11 Incidence of Nosocomial Infection:**

Parameter	Value
Total ICU admissions during study period	200
Number of nosocomial infections	16
Incidence of nosocomial infection	8%

11 Patients had urinary tract infection, 4 patients had hospital acquired pneumonia and only 1 patient had blood stream infection. 5.5% patients had urinary infection, 2% patients had respiratory infection and 0.5% patients had blood infection.

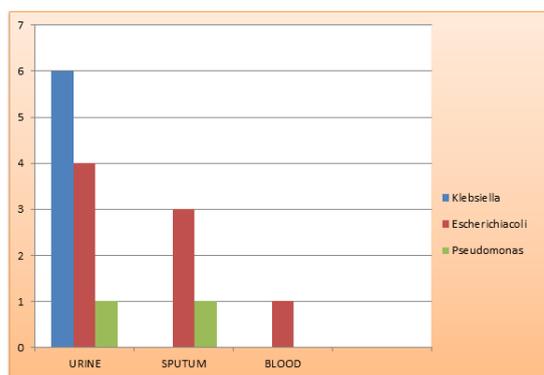
**TABLE: 12 Nosocomial infection as per various cultures:**

Culture	Positive cases		Negative cases	
	No	%	No	%
Urine	11	5.5	189	94.5
Sputum	4	2.0	196	98.0
Blood	1	0.5	199	99.5
Total	16	8.0	184	92.0
'p' value between Urine & Sputum culture	0.1143 Not significant			
Urine & Blood culture	0.0083 Significant			
Sputum & Blood culture	0.1859 Not significant			

**ORGANISMS IN CULTURES**

Urinary tract infection was caused by klebsiella in 6 patients, E.coli in 4 patients and pseudomonas in 1 patient. Hospital acquired pneumonia was seen in 4 patients out of which 3 were due to klebsiella and 1 due to pseudomonas. Blood stream infection was seen in 1 patient only which was caused by klebsiella. 5.5% patients had urinary tract infection. 2% patients had hospital acquired pneumonia and only 0.5% patient had hospital acquired blood stream infection. The most common organism causing nosocomial infection is klebsiella followed by E. Coli.

**FIGURE 1: Nosocomial infections as per various organisms**



Klebsiella caused 55%, E.coli caused 36% and Pseudomonas caused 9% of UTI.

**TABLE 13: Nosocomial infections as per various organisms**

Organisms	Positive cases		Negative cases	
	No	%	No	%
Klebsiella	10	5	190	95
Escherichia coli	4	2	196	95
Pseudomonas Aeruginosa	2	1	198	99
Total	16	8	184	92
'p' value between Klebsiella and E.coli	0.1737 Not significant			
Klebsiella and Pseudomonas	0.0402 Significant			
E.coli and Pseudomonas	0.3426 Not significant			

10 patients had Klebsiella infection, 4 had infection with E.Coli and only 2 had Pseudomonas infection. Klebsiella was responsible for 62% of hospital acquired infection. E.coli was responsible for 25% of infections and pseudomonas aeruginosa was responsible for 13% of infection.

**TABLE 14: Age and Nosocomial infection**

Nosocomial infection	Age in years		
	Range	Mean	SD
Positive	41-80	59.3	9.6
Negative	13-79	44.9	17.3
'p'	0.0011 Significant		

All 16 nosocomial infections were seen in patients aged more than 40 years. None of the infection was seen in patients below 40 years of age. The mean age of the patient affected with nosocomial infection was 59.3 years. Age was a significant factor in the incidence of nosocomial infection as per this study. The p value was 0.0011 which was highly significant.

**DISCUSSION**

The incidence of nosocomial infection in this study is 8%. The commonest infection was Urinary tract infection followed by respiratory tract infection and blood stream infection. Klebsiella was the most common organism followed by Escherichia coli and pseudomonas aeruginosa. Urinary tract infection was caused mostly by klebsiella, Escherichia coli and pseudomonas. Respiratory infection was caused by klebsiella and pseudomonas. Blood stream infection was caused by klebsiella.

The age of patients admitted in IMCU was between 13 years and 85 years. 63% of patients were above 40 years of age. The most common age group was between 40 to 50 years i.e. 22.5%. All nosocomial infections were in patients above 40 years old and it is statistically significant. In this study age had a significant relation to nosocomial infection.

In this study nosocomial infection was equally distributed between male and female. There was no statistically significant correlation between sex and nosocomial infection. In this study out of the 16 patients with nosocomial infection 4 had diabetes mellitus i.e. 25% of the patients with nosocomial infection had diabetes mellitus. Urinary

tract infection was seen in 2 diabetics and 9 non-diabetics i.e. 18% were diabetic and the remaining 82% were non-diabetic. Out of the 4 patients with respiratory infection one was a diabetic i.e. 25% were diabetic and 75% non-diabetic. Blood stream infection was seen in only one patient who was diabetic.

**CONCLUSION**

- The incidence of nosocomial infection in patients admitted in Intensive Medical Care Unit was 8% in the study population.
- The commonest infection was Urinary tract infection followed by respiratory tract infection and blood stream infection.
- Gram negative bacteria especially Klebsiella was the predominant organism.
- Age was a significant factor in this study. All patients who had Nosocomial infection were above 40 years. Old age patients were more susceptible than young patients.
- There was no significant different in incidence between male and female patients.

**REFERENCES:**

1. S. Krishna Prakash Nosocomial infection-an overview [http://www.researchgate.net/publication/18951524\\_Nosocomial\\_infections\\_an\\_overview](http://www.researchgate.net/publication/18951524_Nosocomial_infections_an_overview) [Accessed on 10th October, 2014]
2. S. Brusaferro, L. Arnoldo, G. Cattani, E. Fabbro, B. Cookson, R. Gallagher, et al. Harmonizing and supporting infection control training in Europe. J Hosp Infect, 89 (4) (2015), pp. 351-356
3. C.W. Obiero, A.C. Seale, J.A. Berkley Empiric treatment of neonatal sepsis in developing countries Pediatric Infect Dis J, 34 (6) (2015), pp. 659-661
4. P.R. Murray, K.S. Rosenthal, M.A. Pfaller Medical microbiology (5th ed.), Mosby Inc, Missouri (2005)
5. World Health Organization Prevention of hospital-acquired infections: a practical guide World Health Organization, Geneva (2002) 6.S. Lolekha, B. Ratanaubol, P. Manu Nosocomial infection in a teaching hospital in Thailand: Phil J Microbiol Infect Dis, 10 (1981), pp. 103-114