



## An assessment on contingency of nosocomial pneumonia in a tertiary care hospital - Kerala

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### ABSTRACT

Nosocomial Infections (NIs) are the infections acquired in hospital by a patient who was admitted for a reason other than that infection. It comprises one of the leading causes of preventable injuries and deaths in hospitals, affecting 5% to 10% of hospitalized patients worldwide and contributing to increased morbidity, mortality, length of stay and cost. A cross-sectional, retrospective study was carried out at a tertiary care hospital, Kerala for a period of one year (August 2016 - September 2017) with the aim of assessing the contingency and specific risk factors of nosocomial pneumonia in a tertiary care super specialty hospital. Out of 988 patients selected 140 (14.17%) developed NIs and the prevalence of nosocomial pneumonia was found to be 12.85%. Out of 140 NIs, 134 were bacterial (95.72%) and 6 were fungal infections (4.28%). When analyzing the nosocomial infection events developed by bacterial species 107 (79.85%) were developed because of gram negative species and the remaining 27 that is (19.28%) were due to gram positive species. *Pseudomonas species* was the most common pathogen identified, responsible for nosocomial pneumonia (55.55%). In our study the major specific risk factor for nosocomial pneumonia was found to be mechanical ventilation for more than three days (77.77%). An age of more than sixty is also considered as a risk factor for development of the condition. From this study it can be summarized that hospitalized patients have a possibility of being harmed by NIs. It was found that invasive devices used in patient care were the major risk factor for infections which must be accounted. As NIs may lead to increased health care cost, antibiotic resistance, unnecessary patient sufferings, each hospital should adopt methods like special geriatric care, framing infection control department, and antibiotic stewardship programs to manage nosocomial infections. Early recognition, restricted and short term use of invasive devices can contribute significantly towards decreasing the incidence of NIs.

### INTRODUCTION

**A** nosocomial infection (NI) also called "hospital acquired infection" can be defined as: An infection acquired in hospital by a patient who was admitted for a reason other than that infection. An infection occurring in a patient in a hospital or other healthcare 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.[1]

Usually, NIs are caused by pathogens like bacteria, virus and fungus. Common pathogens are *staphylococci*, *pseudomonas*, *E. coli*, *klebsiella*, *candida*, *trichosporon*, etc and they lead to increased morbidity and mortality of the patient.[2]

Nosocomial pneumonia occurs in several different patient groups. The most important are patients on ventilators in intensive care units, where the rate of pneumonia is 3% per day. Ventilator-associated pneumonia (VAP) is a leading cause of morbidity and mortality in intensive care unit (ICU) patients,

increased length of stay the high cost of treatment[3,4] Ventilator-associated pneumonia (VAP) is defined as nosocomial pneumonia in mechanically ventilated patients that develops more than 48 hours after initiation of mechanical ventilation (MV). VAP is the second most common nosocomial infection after urinary tract infection in intensive care units. VAP divided into early onset VAP which occurs within 5 days of mechanical ventilation and late onset VAP, which develops five or more days after initiation of mechanical ventilation.[5,6]

Pathogenesis of VAP is multi factorial. First, tracheal intubation promotes the aspiration of colonized oropharyngeal secretions across the endotracheal tube (ETT) cuff. Then, the inoculum of pathogens reaches the lungs and may ultimately cause VAP in critically ill patients with significant impairment of respiratory defenses.

Microorganisms colonize the stomach, upper airway and bronchi, and cause infection in the lungs (pneumonia): they are often endogenous (digestive system or nose and throat), but may be exogenous, often from contaminated respiratory equipment. The definition of pneumonia may be based on clinical and radiological criteria which are readily available but non-specific: recent and progressive radiological opacities of the pulmonary parenchyma, purulent sputum, and recent onset of fever.

Diagnosis is more specific when quantitative microbiological samples are obtained using specialized protected bronchoscopy methods. Known risk factors for infection include the type and duration of ventilation, the quality of respiratory care, severity of the patient's condition (organ failure), and previous use of antibiotics. Apart from ventilator-associated pneumonia, patients with seizures or decreased level of consciousness are at risk for nosocomial infection, even if not intubated. Viral bronchiolitis (respiratory syncytial virus, RSV) is common in children's units, and influenza and secondary bacterial pneumonia may occur in institutions for the elderly. With highly immune compromised patients, *Legionella spp.* and *Aspergillus pneumonia* may occur. In countries with a high prevalence of tuberculosis, particularly multi resistant strains, transmission in health care settings may be an important problem. [1]

Hence the present study was undertaken to assess the contingency and prevalence of nosocomial pneumonia in a tertiary care hospital, Kerala.

## MATERIALS AND METHODS

A cross-sectional, retrospective study was conducted for a period of one year at a tertiary care super specialty hospital, Kerala. The hospital receives referred patients from all parts of the state and provides local emergency service and caters to health tourism primarily from the Middle East countries. The study population includes patients admitted to the hospital and whose specimens were sent for culturing having diseases like urinary tract infections, respiratory tract infections, septicemia, surgical wound infections, pneumonia, otitis media etc.

The data on socio-demographic variables and associated risk factors were collected based on the number of patients whose body specimen send to microbial culture to confirm infections from patients admitted in the hospital with the help of predesigned data collection form. The collected cases were screened for NIs based upon display of any infective symptoms after 48 hours or of admission of which was at the time of admission was absent. Presence of different NIs was confirmed on the basis of Centers for Disease Control and Prevention criteria. An evaluation and statistical analysis of nosocomial pneumonia was done from the collected data using SPSS software version 20.0. Prior ethical approval was obtained from the Ethical committee of the hospital. Inpatients whose body specimens send to microbial culture from all departments of the hospital, New born to geriatric patients and patients with nosocomial pneumonia were included in this study. The study excluded inpatients whose specimens not send for culture, patients with community acquired infection.

## RESULT

During the study period 988 patients were selected, out of them 527 were males and 461 were females. From this a total of 130 patients were identified with 140 episodes of Nis (Table 1). On analysis of the data it is confirmed that out of 130 patients with NIs 72 were mail and 68 were female.

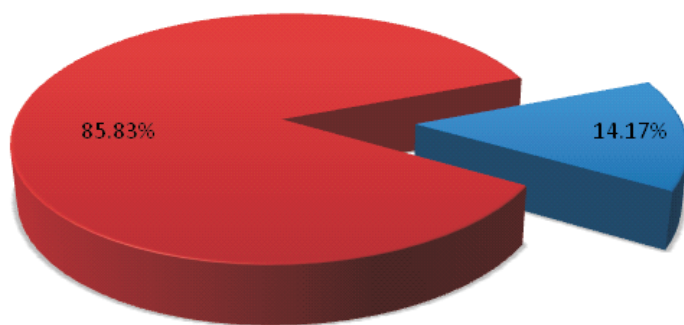
The distribution pattern of NIs in the hospital was found to be as follows, urinary tract infection 54 (38.57%), surgical site infection 35 (25.0%), blood stream infection 20 (14.28%), pneumonia 18 (12.85%) and other respiratory tract infection 13 (9.28%) (Figure 2). From the result it is clear that the chances for development of nosocomial pneumonia in hospital are high. Out of 18 cases of Pneumonia, the microorganism responsible for infection was analyzed and it was as follows. *E.coli* was (11.11%) followed by *Klebsiella* (11.11%), *Pseudomonas sp.*(55.55%), *Enterobactor sp.*(11.11%) and *Acinetobactor sp.*(11.11%) (Figure 3). On evaluation of risk factors, study reveals that out of the 18 cases of nosocomial pneumonia 10 were males and 08 were females( Table 2) Nosocomial pneumonia was most commonly in an age group of 11-50 (33.33%) followed by seen above the age of 60 (22.3%).( Table 3). Highest number of nosocomial pneumonia was noted for the cases that were admitted for a period of 16-20

**Table 2 :** Gender distribution of Nosocomial pneumonia patients

Gender	NUTI Patients
Male	10
Female	08

**Table 1 :** Prevalence of Overall Nosocomial Infection

Sl. No	Number Of Nosocomial infection	Total Number Of Patients	Prevalence
1	140	988	14.17 %



■ Patients developed Nosocomial infection ■ Patients without Nosocomial infection

Figure 1 : Prevalence of overall NIs

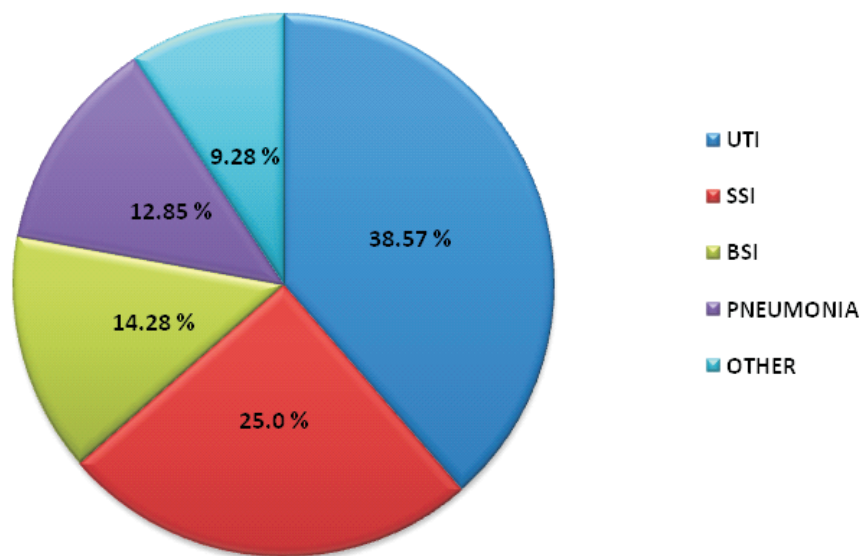


Figure 2 : Prevalence of NIs based on infection site

Table 3 : Distribution of nosocomial pneumonia patients by Age

Sl. No	AGE (year)	Pneumonia
1	Neonate	2
2	Infant	-
3	1-10	2
4	11-50	6
5	51-60	2
6	61-70	4
7	> 70	2

Table 4 : Duration of hospital stay

Sl. No	Days	UTI
1	0-5	0
2	6-10	0
3	11-15	0
4	16-20	8
5	21-30	6
6	>30	6

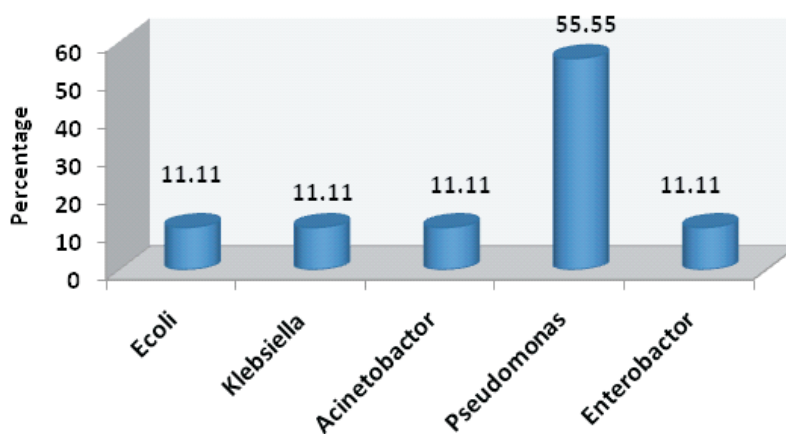


Figure 3 : Distribution pattern of micro organisms causing nosocomial pneumonia

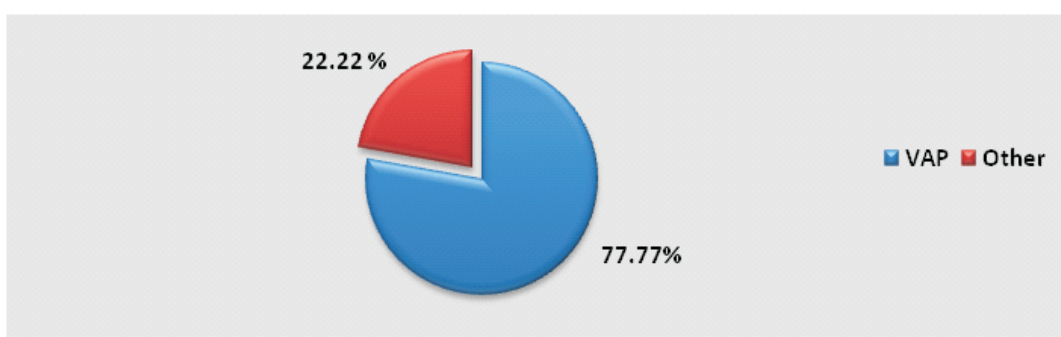


Figure 4 : Distribution of Nosocomial Pneumonia Ventilator associated and others

days.(Table 4). Out of 18 cases of Pneumonia, VAP cases were 77.77% and 22.22 % due to other reason (Figure 4). Out of a total Of 94 Mechanically Ventilated Patients VAP Incident Rate was 14.89%. While considering the factors develops pneumonia Out of 18 pneumonia patients, 77.77% were mechanically ventilated for more than 3 days, 55.55% tracheostomy, 77.77 % unconsciousness, 22.22% steroid use, 77.77% MDR Pathogen, Neurosurgery 55.55 %.

## DISCUSSION

NIs are becoming increasing problems for hospitalized patients. They are major causes of death and disability worldwide. According to estimates reported by the World Health Organization, up to 15% of hospitalized patients suffer from infections associated with health care. Moreover, hospitals worldwide are continuing to face the crisis of the upsurge and dissemination of antimicrobial-resistant bacteria, particularly those causing nosocomial infections in hospitals. The increased occurrence of nosocomial infection rates can be best summed up by three major contributing factors. The first is, overuse of antimicrobials and long-term care facilities. The second contributing factor is increased transmittance rate of infection through hospitalized patients, bystanders and staff. Finally, unscientific allocation of infective patients and lack of standard antibiotic guidelines for the treatment of microbiology infections also leads to occurrence of NIs. In our study, the overall prevalence of NIs and the patterns of distribution of these infections were studied. The percentage of NIs in the hospital was found to be 14.71%.

In the case of pneumonia *Pseudomonas species* was found to be the highest contributors in all the 18 cases of Pneumonia, followed by, *Ecoli*, *Klebsiella*, *Enterobactor* and *Acinetobactor*. The findings were similar to the studies conducted by Yaseen Arabi et.al<sup>9</sup>. In their study, *Pseudomonas* was most common pathogen for pneumonia followed by *Acinetobactor sp.*

Specific risk factors for nosocomial pneumonia were identified during the study which will help the health care professionals to prevent the occurrence of further events of pneumonia. Out of eighteen cases of nosocomial pneumonia maximum (77.7%) events were ventilated associated cases and the remaining cases were because of other reasons. The study identified some specific risk factors of NIs. They are mechanical ventilated more than 3 days, tracheostomy, use of steroid, presence of multi drug resistant pathogen, and neurosurgery. These findings are similar to the works Kampf G et.al<sup>10</sup>, which suggests that, the use of ventilator support increased the risk of pneumonia from 2.0% to 25%. Thoracic surgery was associated with the greatest attack rate for nosocomial respiratory infections, followed by Neurosurgery with decreasing attack rates associated with Gastrointestinal, Orthopedic and General Surgery.

## CONCLUSION

Infections acquired in hospital are likely to complicate illness, cause anxiety and discomfort, and can lead to death. These infections result in substantial morbidity, mortality, and increased financial burden. Our study reveals a high prevalence of nosocomial infection in admitted patients, which is a major concern and should be prevented. There is direct relation with

age of patient, duration of hospital stay and presence of risk factors with development of Nis in hospital. Geriatric population is highly vulnerable to nosocomial infections. The study identified high prevalence of nosocomial pneumonia even in tertiary care hospital. Our study also reveals that the incidence of infections increases with use of invasive devices. Early recognition of infections, restricted and short term use of invasive devices can therefore, contribute significantly towards decreasing the incidence of nosocomial infections in elderly. We suggest that each hospital must have a standard antibiotic guideline for the treatment of microbiology infections. It will be more specific if the hospital is implementing antibiotic stewardship programmes there by promoting rational use of drugs and devices.

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