



RESEARCH ARTICLE

STUDY OF HOSPITAL-ACQUIRED INFECTIONS IN A TERTIARY CARE HOSPITAL-A PILOT STUDY.

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Abstract

Introduction: Nosocomial infections are those infections acquired as a result of treatment in a hospital or health care service providing center so they are also known as hospital-acquired infections(HAI). Nosocomial infections usually encountered include urinary tract infection, respiratory tract infection and Enterococci infections.

Objectives: Study was focused on determining the various nosocomial infection occurring in tertiary care hospital, common microorganisms involved in causing nosocomial infection and commonly used antibiotic for treatment of nosocomial infections.

Methodology: This was a prospective, cross-sectional, and observational study carried out in different wards and departments of a tertiary care hospital for a period of six months. Patients data was collected from the inpatient profile form, patient history records, laboratory data.

Results: A total number of 100 subjects included from different wards to evaluate the study. The percentage of male subjects and female subjects was calculated 42% and 58% respectively. all the subjects were found below the age of 75 years, maximum subjects(35%) were found in age group of 20-40 years. The obtained data shows that most of the subjects were infected by gram-negative microorganism(80%), maximum number of cases were found infected with urinary tract infection(52%), followed by surgical site infection(43%), neonatal infection(3%) and respiratory tract infection(2%). The common microorganisms involved in causing nosomial infections was Escherichia coli(44%), Enterococcus spp.(15%), Enterobacter spp.(28%). Antibiotics such as nitrofurantoin, cefoperazon+sulbactam, amikacin were mostly used for the treatment of various nosocomial infections.

Conclusion: It was concluded that gram-negative and gram-positive pathogens were responsible for majority of nosocomial infections occurring in a tertiary care hospital. In the study, maximum number of cases were found infected with urinary tract infection, followed by surgical site infection. The most common bacteria found was Escherichia coli, Enterobacter spp., Enterococcus spp. Most effective antimicrobial agent for gram-negative pathogens wereimepenem,

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nitrofurantoin and amikacin and for gram-positive pathogens was linezolid.

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Introduction:-

The discovery and development process of different antibiotics is one of the greatest advances in modern medicine^[1]. Antibiotics always play a good role in reducing the symptoms of disease, shortening the span of illness and controlling its transfer in the community^[2]. Unfortunately, the microorganism have developed several mechanism of resistance against various antibiotics such as synthesis of drug inactivating enzymes like beta lactamases which act by hydrolysing the beta lactam antibiotics, decreasing the target susceptibility by creating target alteration, development and modification of different barriers and by altering the metabolic activity^[3-5]. Antibiotic resistance genes are not involved in increasing the virulence nature of bacteria, but the infections caused by these resistant bacteria do not respond to treatment, that leads to morbidity and mortality^[1].

India has huge number of problems relating antibiotic abuse. The overuse and inappropriate use of antibiotics always give rise to antibiotic resistance. Diseases and infections that were earlier treated by the certain antibiotics easily are now becoming difficult to treat as microorganisms involved in causing them have acquired resistance to these antibiotics. According to report about 70% of microorganisms that causes infections in hospital are resistant to at least one of the most commonly used antibiotics for the treatment of that infections^[6]. Some of the studies suggest the use of combination therapy to prevent the resistance but the effect are not exactly known^[7, 11]. Despite the fact that antibiotics have played a great role in revolutionizing the management of many clinical syndromes caused by infections, the increasing use of this antibiotics in different ways such as, indiscriminate prescribing, inappropriate dosing and inappropriate duration of treatment, over the counter use of antibiotics to the general public, use in animal husbandry, and use of the same in horticulture has great contribution in the rise of antibiotic resistance among various common microorganisms^[7].

Nosocomial infections are those infections which are acquired as a result of treatment in a hospital or health care service providing center. These infections usually appear after 48 hours or more of admission in hospital or health care providing centres within 30 days after discharge. Nosocomial infections have been one of the major problem to health care delivery system. These results in prolonged recovery of patients and even death when not treated earlier. Different types of bacteria, fungi and viruses have been involved in the development of nosocomial infections. Nosocomial infections usually encountered are urinary tract infection, respiratory tract infection, Enterococci and Enterobacter spp. infections. Microorganisms usually involved in the infections are among Pseudomonas aeruginosa, Escherichia coli, Staphylococcus aureus, Klebsiella species, Mycobacterium tuberculosis, and Clostridium difficile, these are rapidly gaining resistance because of the broad spectrum antibiotics used to control them. Most of these organisms are usually contaminants on the surfaces of most materials such as doors, beds, instruments and on care providers. They are therefore easily transmitted to patients when proper hygienic practices are not followed regularly. Patients admitted in the intensive care unit are mainly at risk of these hospital acquired infections. Even though several measures have been taken by hospital officials to prevent these infections by ensuring strict sanitation, hygienic principles and rational antibiotic use, the incidence of nosocomial infections still keep on rising with pace^[8].

According to report, the incidence of nosocomial infections is about 5-10% in most developed nations while in India, one in four patients admitted into the hospital acquire nosocomial infection. Common nosocomial infections in surgical patients include surgical site infections (SSI), urinary tract infections, pneumonias and blood stream infections. Surgical site infections (SSI) account for approximately a quarter of all nosocomial infections. These infections can range from superficial wound infections, which have minimal mortality rates but add a considerable cost to patient care, to necrotizing soft tissue infections, which are associated with prolonged hospitalization, significant healthcare expense and a high mortality rate^[9].

Urinary tract infection (UTI) is the second most common infections after respiratory tract infections and gastrointestinal infections^[8]. The irrational use of an antibiotic as well as prescribing of antibiotics without prior sensitivity testing is directly related with the development of resistance. UTI was found as the most common cause of nosocomial infection among hospital admitted patients^[10].

This study therefore seeks to investigate the antibiotic resistance patterns of some of these microorganisms. This will contribute to data on the susceptibility of nosocomial bacteria to antibiotics in current use.

Methodology:-

This was a prospective, cross-sectional, and observational study carried out in different wards and departments of a tertiary care hospital for a period of six months. Patients data was collected from the inpatient profile form, patient history records, laboratory data. Patients of either gender and inpatient in various departments of the hospital were included in the study. The inpatient profile form, patient history records, laboratory data of different departments of hospital was evaluated and microorganisms reported, antibiotics prescribed was noted down from mention records and data. Data analysis was done by using Microsoft excel and results were recorded on percentage basis.

Ethical Consideration:-

The protocol was submitted to Ethical committee and was approved by Institutional Ethics Committee. Collection of data was started after approval from Institutional Ethics Committee.

Results:-

A total number of 100 subjects included from different wards to evaluate the study of antibiotic sensitivity pattern in nosocomial infection at a tertiary care hospital. The data collection and reports were analyzed. The demographic profile of patient is classified as gender wise distribution, age wise distribution. In this study out of 100 subjects, 42 subjects were man and 58 were woman. The percentage of male subjects and female subjects was calculated 42% and 58% respectively.

Table No 1:- Gender Wise Distribution Of Subjects

Gender	No. of patients	Percentage
Male	42	42%
Female	58	58%

All the subjects during the study were found below the age of 75 years. Subjects were catogerised in four groups as per there age(less than 20, 20-40, 40-60, more than 60 years). Maximum subjects(35%) were found in age group of 20-40 years.

Table No 2:- Age Wise Distribution Of Subjects

Age	No. of patients	Percentage
Less than 20 year	9	9%
20-40 years	35	35%
40-60 years	28	28%
More than 60 years	28	28%

The obtained data shows that most of the subjects were infected by gram-negative microorganism(80%) than gram-positive microorganism(17%) and fungi(3%).

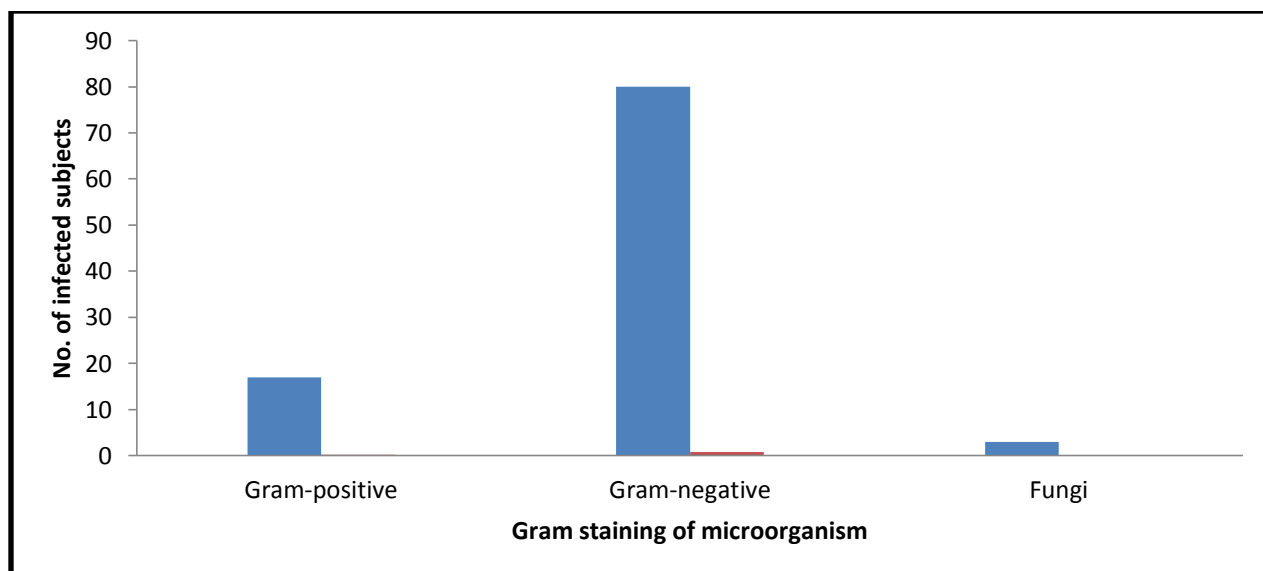


Figure 1:-Gram staining wise distribution

In the study, maximum number of cases were found infected with urinary tract infection(52%), followed by surgical site infection(43%), neonatal infection(3%) and respiratory tract infection(2%).

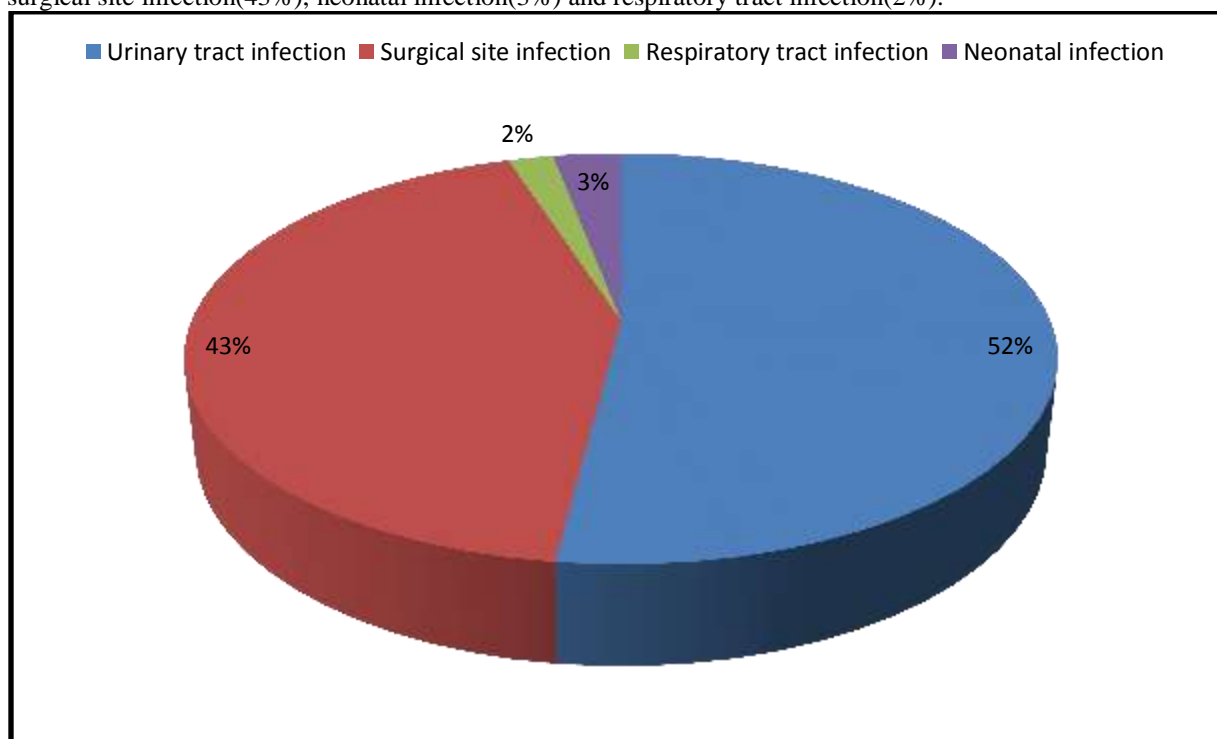


Figure 2:-Various nosocomial infection wise distribution

The study shows that the common microorganisms involved in causing nosomial infections was *Escherichia coli*(44%), *Enterococcus spp.*(15%), *Enterobacter spp.*(28%), *Klebsiella spp.*(5%), *Staphylococcus spp.*(2%), *Proteus*(3%) and *Candida spp.*(3%).

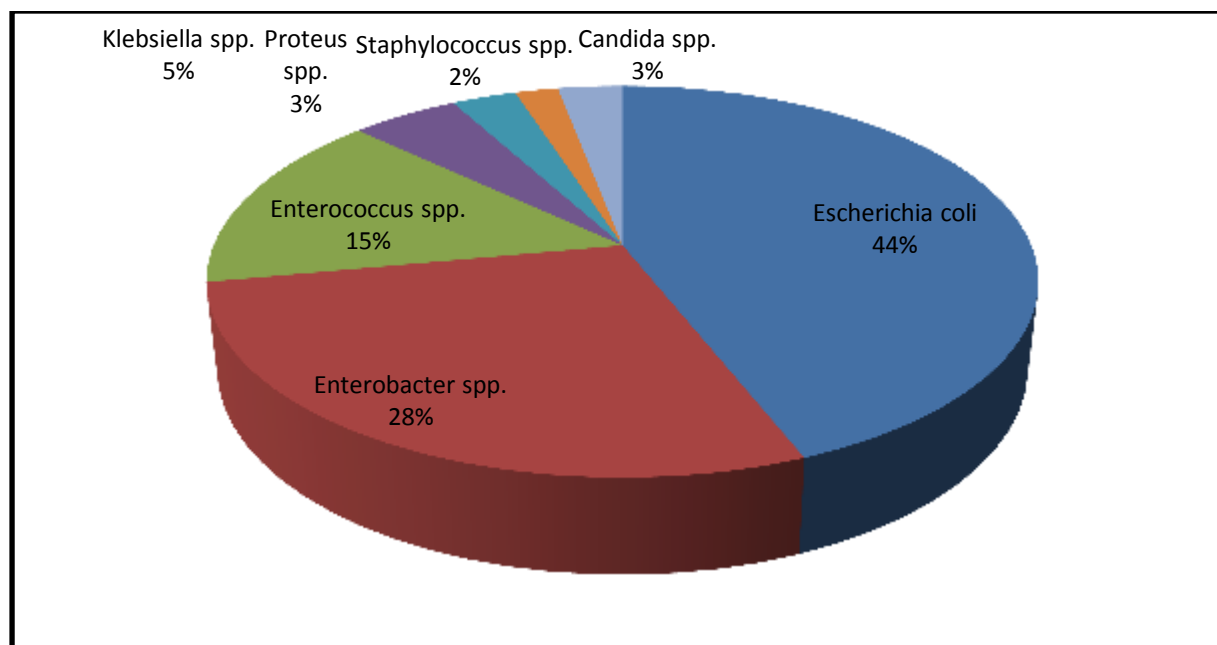


Figure 3:-Common microorganism involved in causing nosocomial infections

The study found that the antibiotics such as nitrofurantoin, cefoperazon+sulbactum, amikacin were mostly used for the treatment of various nosocomial infections.

Table 3:- Antibiotics Used For The Treatment Of Nosocomial Infections

Antibiotics	Percentage
Nitrofurantoin	31.25%
Ceftriaxone	6.25%
Amikacin	15.62%
Amoxycillin+Clavulanic acid	4.69%
Ofloxacin	1.79%
Ciprofloxacin	1.79%
Pipracillin+Tazobactam	2.34%
Levofloxacin	3.13%
Azithromycin	3.13%
Cefoperazone+Sulbactum	11.71%
Amphotericin B	0.78%
Fluconazole	1.56%
Linezolid	5.47%
Gentamycin	6.25%

Discussion:-

Generally nosocomial infections are prominently found in inpatients admitted in different wards and units of tertiary care hospital. This is because of different surgical intervention and operative procedures. Important breeding ground for the nosocomial infections are hospital acute care units, surgical units, medical units, which are commonly involved and important for development and spread of antibiotic resistance bacterias, fungi with other microorganisms, further giving rise to this infections. A total of 100 subjects were taken for conducting the pilot study, suffering from one of the nosocomial infection, out of which approximately all subjects were recovered over a period of time after receiving the proper treatment. Out of this 100 subjects suffering from various nosocomial infection, 97% cases was found to be caused due to bacterial growth and in 3% cases fungi was found as the causing microorganism, which was comparable to Rama Sikka et al.^[9] which shows 95.9% of bacterial infection and 4.1% of fungi as causin microorganism.

The total spectrum of nosocomial infection in a tertiary care hospital involved in the study was dominated by the gram-negative pathogens in comparison of gram-positive and other microorganism found such as fungi. In the present study it was found that gram-negative pathogens had a higher frequency of causing nosocomial infections which was found to be 80%, than that of gram-positive pathogens(17%) and fungi(3%) which was relevant with the study conducted by Amit A Rangari et al.^[7] which also reported the dominance of gram-negative pathogens over gram-positive pathogens involved in causing the nosocomial infections. Rama Sikka et al.^[9] also reported the similar results in there study. Thus the study shows that gram-negative microorganisms wasgining the foothold in causing nosocomial infections in our hospital.

The age and gender wise distribution of the subjects diagnosed with various noscomial infection in different wards of the tertiary care hospital in the present study shows that there were higher number of young adults subjects diagnosed with nosocomial infections, which lies in the age group ranging from 20 years to 40 years of age constituting to 35% of the total subjects with noscomial infection, with 28% of that of age group between 40 years to 60 years of age and same percentage was found with age more than sixty years of the included subjects in the study. Only 9% of the subjects were found to be suffering from nosocomial infections within the age group that lies between zero to 20 years of age, i.e from neonates to the age of 20 years. In present study it was found that female patients are more prompt of acquiring nosocomial infection as compared to male subjects, constituting 58% of subjects, on the other hand 42% of the male subjects was found to be suffering from the various nosocomial infections. This correlates with the study conducted on gram negative bacilli causing nosocomial infections by Md. Abdullah Yusuf et al.^[10] which shows that higher number of young adult female patients were diagnosed with nosocomial infections as compared to male subjects.

In the present study conducted on 100 subjects with nosocomial infection, urinary tract infections(UTI) was found dominating as compared to the nosocomial infections caused by other gram-negative, gram-positive and fungi with 52% of cases. Second most common nosocomial infection was found to be surgical site infection(SSI) with 43% of cases, followed by nosocomial infections having 3% of cases and respiratory tract infections with 2% of cases found. This was comparable with study done by Md. Abdullah Yusuf et al.^[10] but the other study of Rama Sikka et al.^[9] found surgical site infections(SSI) more dominant than urinary tract infection which was at second number, but this study included only surgical admissions in there study group.

The present study study shows that most common gram-negative, gram-positive and fungi pathogens involved in causing nosocomial infections was *Escherichia coli*, *Enterobacter* spp., *Eterococcus* spp., *Klebsiella* spp., *Proteus* spp., *Staphylococcus* spp. and *candida* spp. Among the bacteria causing urinary tract infections, the common aetiology was found to be *Escherichia coli*(44%) with *Klebsiella*(5%) and *proteus* spp.(3%), this was comparable with the study of Shalini et al.^[12]. The other isolates found was *Enterobacter*(28%) and *Enterococcus* spp. (15%) responsible for causing surgical site infections which was also found in the study done by Rama Sikka et al.^[9] between surgical admission and in the study of Md. Abdullah Yusuf et al.^[10]. Other pathogens involved was *Staphylococcus* spp.(2%) and *Candida* spp.(3%) found causing respiratory tract and neonatal infections respectively. From the present study, it was found that nitrofurantoin, imepenem, amikacin, linezolid, combination of antibiotics like cefeperazone+sulbactum and antifungal like voriconazole, fluconazole was mostly involved for the treatment of various nosocomial infections in different wards of the tertiary care hospital. In the present study, the sensitivity pattern trends of microorganisms for antibiotics employed for there treatment shows that imepenem, nitrofurantoin with amikacin was the first choice of drug used for the treatment of urinary tract infection with >90% sensitivity for pathogens like *Escherichia coli*, *Klebsiella* and *Proteus* spp. This trends was much similar to study of Md. Abdullah Yusuf et al.^[9] and study of Shalini et al.^[12]

Enterobacter spp. was also found sensitive for imepenem(100%) and amikacin(96.4%) which was correlated with the study conducted by Rama Sikka et al.^[9] which shows 100% sensitivity towards amikacin. In the present study linezolid was employed for the treatment of nosocomial infections involving *Enterococcus* spp. which was correlated to the study conducted by Amit A Rangari et al.^[7] which shows that linezolid was mostly used agent for treatment of gram-positive cocci.

Conclusion:-

It was concluded that gram-negative and gram-positive pathogens were responsible for majority of nosocomial infections occurring in a tertiary care hospital. In the study, maximum number of cases were found infected with

urinary tract infection, followed by surgical site infection. The most common bacteria found was *Escherichia coli*, *Enterobacter* spp., *Enterococcus* spp. Most effective antimicrobial agent for gram-negative pathogens were imipenem, nitrofurantoin and amikacin and for gram-positive pathogens was linezolid.

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