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A Cross-Sectional Study on Nosocomial Infections and Its Prescribing Pattern in a Tertiary Care Hospital

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ABSTRACT

Objective: To conduct a cross-sectional study on nosocomial infections and their prescribing pattern in a tertiary care hospital. Methods: After obtaining approval from the Institutional Ethics Committee, cross-sectional study was carried out among 150 inpatients in a tertiary care hospital in Bangalore. The data were collected from the patient case profile and prescriptions and noted in a self-designed data collection form. The statistical analysis of the collected data was performed using SPSS software and excel. Results: Out of 150 cases, the patients are divided into 8 categories according to their age. Patients who are aged between 40 and 50 have a higher percentage (22.6%) who have developed Nosocomial infections. 70% of patients were above 50 years and 30% of patients were below 50 years of age. The dominant gender was Male(64.6%) and the remaining was filled by Female (35.4%). Among five infections the incidence rate was measured and found to be Bloodstream infection (19%), Catheter-induced infection (25%), Deep surgical site infection (5%), Surgical site infection (43%), Ventilator ventilator-associated pneumonia (8%). Conclusion: The path towards progress and development in the segment of nosocomial infection are related to the consistency and enhancement of infection control programs, codification of guidelines, clinical procedures, and hospital accreditation (with quality improvement and patient safety approach), these factors can be considered effective in reducing Nosocomial infections and additionally more research is needed to examine their effect in wider scopes. The recommendation for more attention towards the practical implications and policy-making to these programs that reduce nosocomial Infections should be considered.

Keywords: Hospital-acquired infection, nosocomial, Central line-associated bloodstream infections, Catheter-associated urinary tract infections, Surgical site infections, Ventilator-associated pneumonia.

INTRODUCTION

Hospital-acquired infection (HAI) or nosocomial infection is 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 occupational infections among staff of the facility. HAIs not only affect patients' health and safety but also the healthcare system as a whole.
Types of nosocomial infection:

- Central line-associated bloodstream infections,
- Catheter-associated urinary tract infections,
- Surgical site infections,
- Deep surgical site infections,
- Ventilator Ventilator-associated pneumonia.

Prevention: Observe the patient in ICU or any other ward that if the patient needs isolation or not to stop the transmission of disease, Hygiene condition should be maintained by washing hands before and after touching the patient, Any type of object insertion in the body should be in aseptic condition, Infection control program should be developed, Antimicrobial use should be appropriate, Air borne precaution should provide, Use aseptic catheter for UTI infection and the urinary bag never have contact with floor, Whenever possible use noninvasive ventilator, Ventilator circuit routinely changing is not required, For the insertion of catheter, Prefer the upper extremity, Wash or clean your skin with chlorhexidine etc.

Treatment: Antibiotics. These are common treatments for nosocomial infections. Medical tests help doctors figure out the specific bacteria causing your infection. Your doctor can then prescribe antibiotics that kill only these harmful bacteria and not the healthy kinds. Rest. You'll likely need to rest your body while you recover from an infection. Physical rest lets your immune system work as hard as it can to fight off illness. Fluids. Water is important for your body while it fights infection. Water helps keep your body cool if you have a fever and keeps your airways hydrated so you won't cough. Your doctor might tell you to drink lots of water. You may also need to get fluid injected into your body through an IV.

REVIEW OF LITERATURE

F.M. Dayyab et al; conducted A prospective study of hospital acquired infections among adults. The study was conducted on patients identified to have developed HAIs while admitted to the medical wards, surgical wards, dialysis units and intensive care unit of the hospital. A total of 100 patients who had 144 episodes of HAIs were studied. Rates of HAI's were 7.16%, 18.63% and 1.75% in the medical wards, ICU and surgical wards respectively. The most common HAIs were Urinary tract infection caused by E. coli.

Dr. Richards Micheal J et al; Analysis of ICU surveillance data collected through the National Nosocomial Infections Surveillance (NNIS) System between 1992 and 1997 in whole united states. A study on Nosocomial infection in a medical intensive care unit in the united states was conducted. They conducted the study on nosocomial infections by infection site and pathogen distribution. The result was conclusive that urinary tract infection were most frequent (31%), followed by Pneumonia (27%) and primary blood stream infections (19%). 86% of the nosocomial pneumonia was associated with medical ventilation, 95% of the UTIs were associated with Urinary Catheters. Coagulase-negative streptococci (36%) were most common blood stream infection isolates, followed by enterococci (16%) and staphylococci aureus (13%).

A.Lizioli et al; A prospective study of 113 tertiary care hospitals in Lombardy, Italy. To observe and study Prevalence of nosocomial infections in Italy in the year 2000, The highest prevalence observed was in ICUs (4.95%) and Spinal units (4.8%) followed by surgical Patients (2.7%). The prevalence of Bloodstream infection was 0.6%; Pneumonia 1.1%; Urinary Tract infection 1.6% and gastrointestinal tract infections was 0.4%. The common isolated pathogen from all sites of infections was E. coli (16%), followed by Staphylococcus aureus (15%), Pseudomonas aeruginosa (13.2%), candida spp. (8.7%).

Vikramjeet Dutta et al; In tertiary care center in north east India, conducted A prospective Study of nosocomial infections among the patients admitted in the intensive care units of a tertiary care centre in north east India. The prospective study was conducted for a period of 1 year. The ICUs included were Anesthesiology ICU (AICU), Pediatric ICU (PICU), Intensive Coronary Care Unit (ICCU) and CardioThoracic and Vascular Surgery (CTVS) ICU. The various clinical specimens received from patients with suspected NI, were subjected to microscopic examination, culture, and biochemical tests, as per standard protocols. Of 2017 patients admitted, 276 patients [126 (AICU), 47 (ICCU), 101 (PICU), 2 (CTVS ICU)] were included in the study of which 8% developed NI. Respiratory Tract Infections (RTI; 43%) were highest followed by Urinary Tract Infections (UTI; 34%), Blood Stream Infections (BSI; 11%), Wound Infections (WI; 10%), Sterile Site Infections (SSI; 2%). the incidences of NI were– AICU – 14%, ICCU – 4% and PICU – 8%.

Keshni Naidu et al; conducted A descriptive study of nosocomial infections in an adult intensive care unit. There were 663 patients admitted to the ICU during the two year study period. This represented 2891 total patient days of admission during which patients were ventilated for 2175 days. Of the 663 admissions, 114 (17%) developed culture confirmed nosocomial sepsis. The majority of the patients had prior admission to other wards before admission to ICU. Males were more commonly represented than females and almost all patients had been mechanically ventilated with a median period of 8 days of ventilation. Of patients, 66% had isolates from respiratory specimen (endotracheal tube or pleural fluid), 49% from a urinary specimen (indwelling catheter or clean catch), 67% from a blood specimen (peripheral or central line), and 41% from a surgical site (wound swab or surgical drain). Gram negative bacteria such as Klebsiella pneumoniae, Acinetobacter species, and Pseudomonas aeruginosa were the commonest isolates. K. pneumoniae (extended-spectrum beta-Lactamase (ESBL) producing) was isolated from blood and urine in 21% of patients simultaneously. Coagulase negative staphylococci were most commonly isolate from blood. Pseudomonas aeruginosa was the commonest isolate from surgical site

specimens. Outcome was known in 84% (96/114) patients and 40% (38/96) with known outcome died in ICU (Table 1). Of 63 patients with a bacterial isolate from the blood and a known outcome, 21 (33%) died, compared to 50% (16/32) among those with a known outcome but without a bacterial isolate from the blood. Of those that died, 55% (21/38) had a blood stream infection.

MATERIALS AND METHODS

Sources of data and materials

- Patient case sheet.
- Patient Prescriptions.
- Laboratory Data.
- Medication treatment chart.
- Nurse's report.
- Self-designed patient data collection form.

Method of collecting data:

The data required for the study will be collected for the patients who are admitted to the ICUs for at least 48 hours. Patient case sheets, nurse reports, progress charts, Medication charts, patient interview notes, and laboratory data of those selected patients will be collected.

Statistical analysis

The data will be entered on Microsoft Excel and the statistical analysis of collected data will be performed using IBM SPSS version 26 statistical software. The results of collected data will be analyzed using statistical analysis and frequencies, percentages, and mean values will be calculated.

Ethical consideration

- Confidentiality will be maintained throughout the study.
- Written informed consent will be obtained from all the participants.
- There is no physical harm to the participants as there is no intervention.

Ethical clearance

The study was applied for ethical clearance to the ethical committee of the Sapthagiri Institute of Medical Sciences and Research Center. This study is based on the analysis of approved surveillance data. The ethical clearance letter no. SIMS&RC/IEC/14/2022-23 dated 23rd September 2022.

RESULTS

Patient's Age-Wise Distribution

Out of 150 cases, the patients are divided into 8 categories according to their age. Patients who are aged between 40-50 in the ICU have high percentage of developing Nosocomial infections. A total of 70% patients were above 50 years of age, while 30% were below 50 years of age.

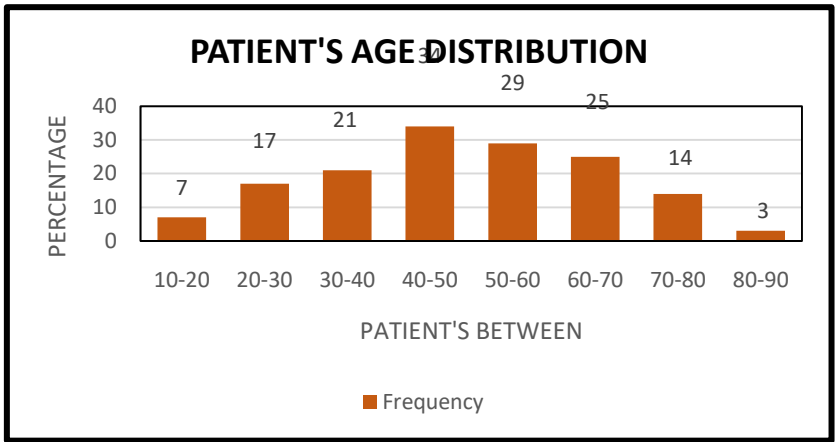

Figure No. - 1: Patient Age Distribution

Gender Distribution

In the current study, the dominant gender was Male (64.6%) and remaining was filled by female (35.4%).

Table No. - 1: Patient Gender Distribution

PATIENT'S GENDER	ENUMERATION	PERCENTAGE
MALE	97	64.6%
FEMALE	53	35.4%

INCIDENCE RATE

Among five infections the incidence rate was measured and found to be Bloodstream infection (19%), catheter induced urinary tract infection (25%), Deep surgical site infection (5%), **Surgical site infection (43%)**, Ventilator associated pneumonia (8%).

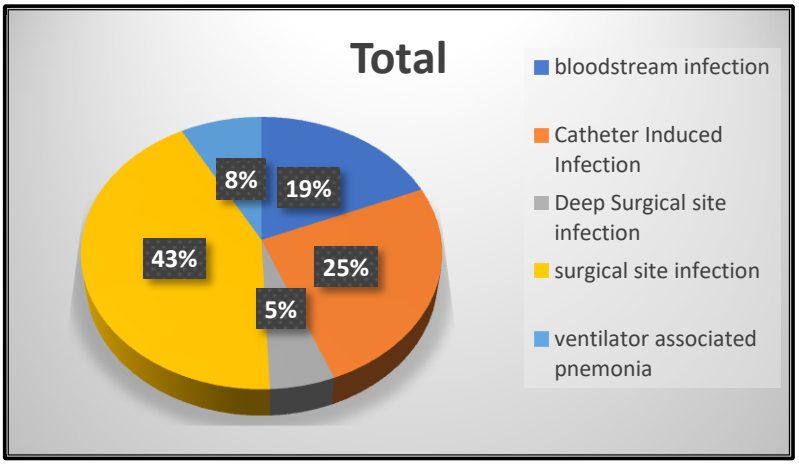

Figure No. - 2: Infection Incidence Rate

Culture Sensitivity Test

Bloodstream Infection

According to the culture sensitivity test, the incidence of E-coli was highest (9 cases)

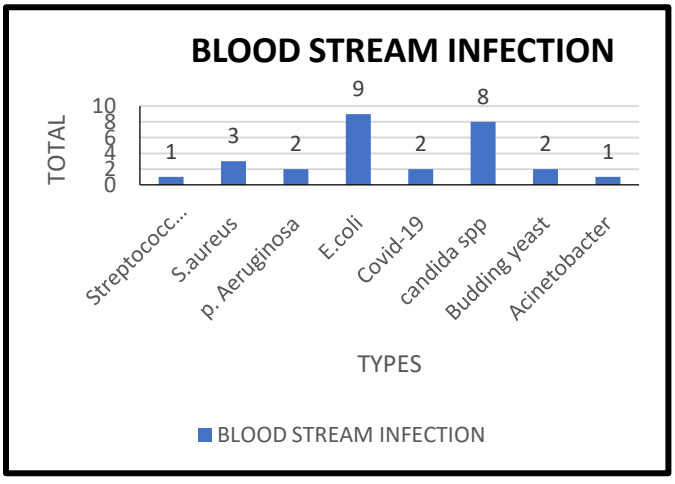

Figure No. - 3: Culture Sensitivity Test of Bsi

Catheter-Induced Urinary Tract Infection

According to the culture sensitivity test , the incidence of E-coli was highest (22 cases)

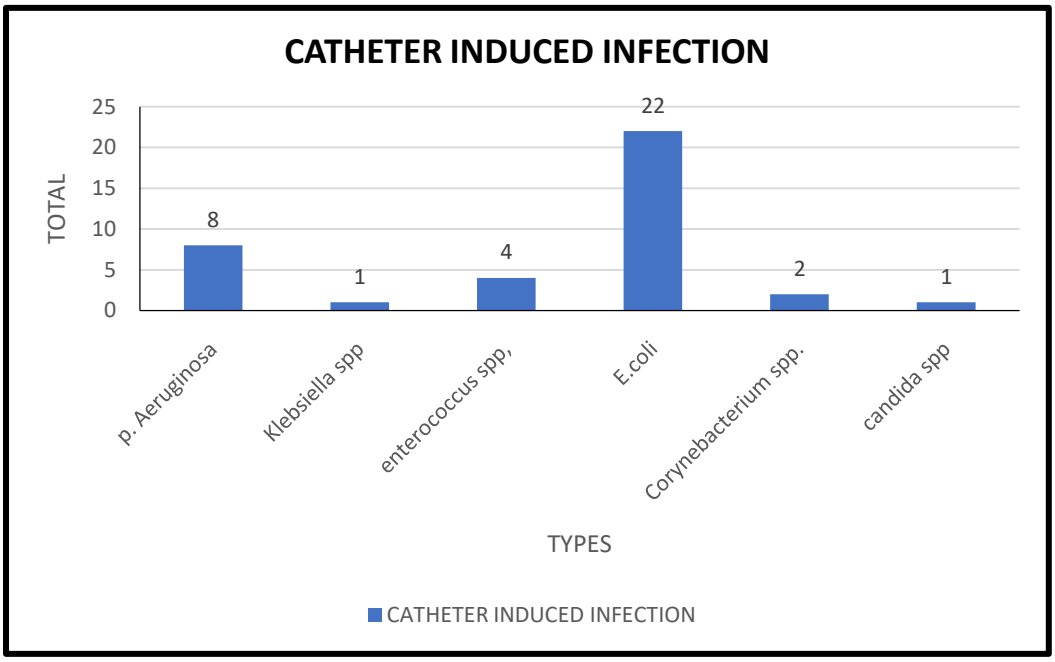

Figure No. – 4: Culture Sensitivity Test of Ciuti

Deep Surgical Site Infection

According to the culture sensitivity test, the incidence of P. Aeruginosa was highest (5 cases).

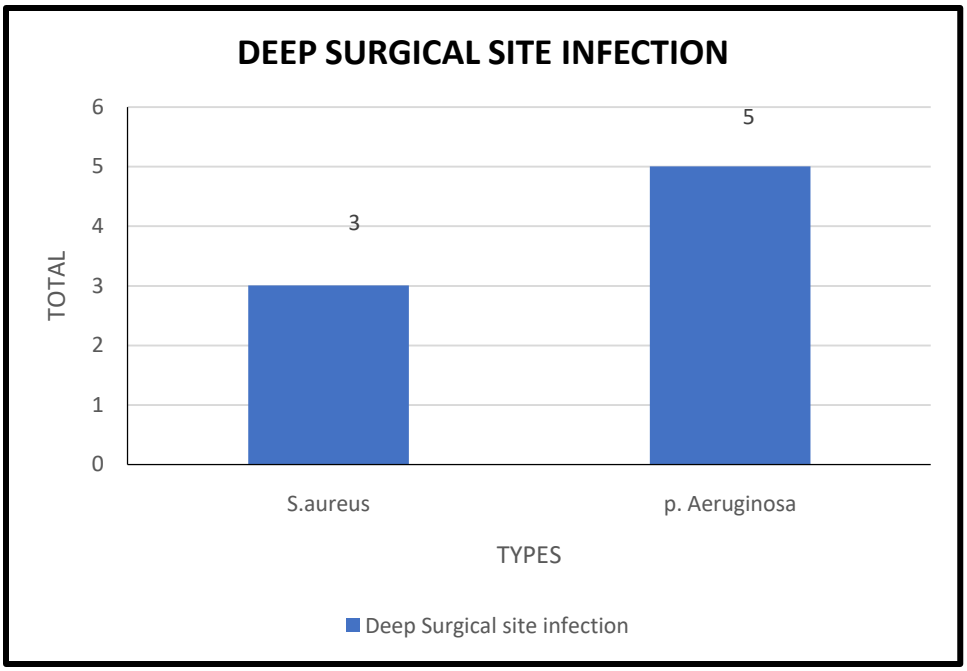

Figure No. – 5: Culture Sensitivity Test Of Dssi

Surgical Site Infection

According to the culture sensitivity test , the incidence of S. Aureus was highest (40 cases)

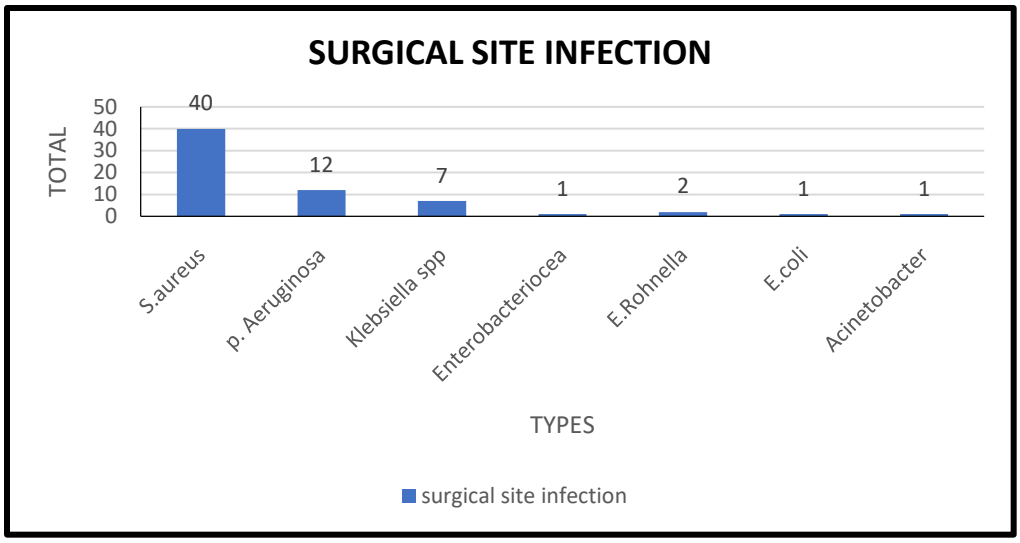

Figure No. - 6 : Culture Sensitivity Test Of Ssi

Ventilator-Associated Pneumonia

TYPES OF BACTERIA	Ventilator-associated pneumonia
S. pneumoniae	12

In the 150 cases collected, the most commonly prescribed Antibiotics (post infection) in the ICU tabulated below

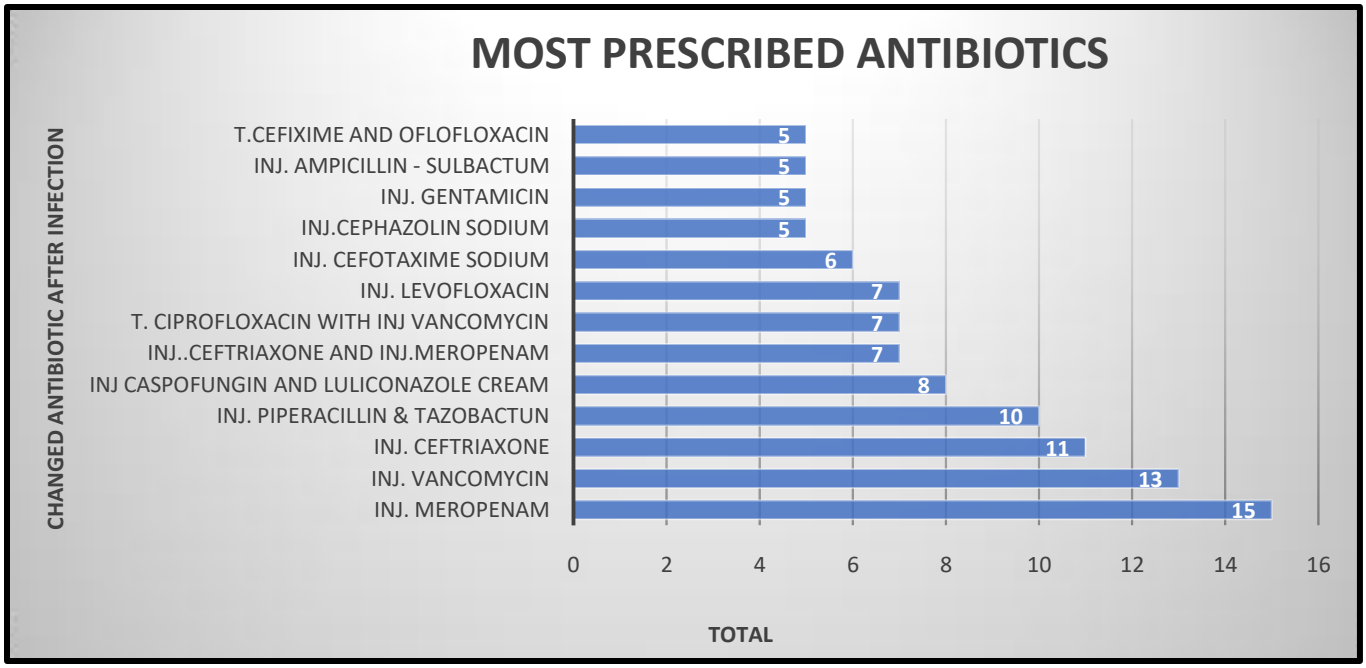

Figure No. - 7: Most Prescribed Antibiotics (Post-Infection)

DISCUSSION

Among the 150 cases collected from our study, we found that the majority were males (64.6%) and females were only(35.4%). The result found to be consistent with the study conducted by Keshni Naidu et al , indicated that males were more prone to nosocomial infection compared to females.

Out of 150 cases, the patients are divided into 8 categories according to their age. Patients aged between 40 and 50 have a higher percentage (22.6%) has developed nosocomial infections. 70% of the patients were above 50 years and 30% of patients were below 50 years of age. In a study conducted by Nasser Yehia Aly et al. It was indicated that 40-60 years (45%) among the observed samples were more prone to nosocomial infection.

In our study among the 150 cases, the incidence rate of infection was measured, and found to be Surgical site infection (43%) was found to be the highest followed by catheter-induced uurinary tract infection (25%), Blood Stream Infection(19%), Ventilator associated Pneumonia (8%), Deep Surgical Site infection(5%). But in a study conducted by Haridimos Markogiannakis et al. Implied that bloodstream infection (36.1%). ventilator-associated pneumonia (VAP); 25.3%, 20.3/1000 ventilator days), Surgical site infection(18.7%), Central venous catheter (10.4%, 7.1/1000 central venous catheter days), and catheter-associated UTI (9.5%, 4.6/1000 urinary catheter days)

Amongst 150 cases the culture sensitivity test resulted in a clear picture of the incidence of microorganisms to cause all the particular infections. In that, the incidence of S.aureus (62.5%), P.Aeruginosa(18.75%), and Klebsiella spp (10.93%) were highest in cases of surgical site infection(64 total cases).

The incidence of E.coli (57.89%), P.Aeruginosa (21.05%), and Enterococcus spp (10.52%) were highest in the case of catheter-inducted UTI (38 total cases).

Out of 28 total cases of bloodstream nosocomial Infections, E.coli (32.14%), Candida spp (28.571%), and S.aureus (10.71%) were observed to be more. Out of 12 cases of ventilator-associated pneumonia S.pneumoneae was the sole cause (100%) of this particular infection.

Lastly, out of 8 cases of Deep Surgical Site Infection, P. aeruginosa (62.5%) and S. aureus (37.5%) were the cause.
In a study conducted by Haridimos Markogiannakis et al, it was observed that the most frequent microorganisms found were: Acinetobacter baumannii (20.3%), Pseudomonas aeruginosa (15.5%), Candida Albicans (30.2%), Enterococcus faecalis (10.4%), Klebsiella Pneumonia (9.2%) and Staphylococcus Aureus(6.7%).

Our study found out the types of antibiotics prescribed post-infection and the pattern of prescribing the same. Out of many classes of antibiotics very few are observed to be frequently used. Effective strategy for screening, and management for HAIs is not fully established like other financially developed countries.

The antibiotic prescribing analysis gives a clear picture of the prescriber's pattern of prescription antibiotics.
In our study, it was observed that the use of Meropenem is the highest, and Inj. Vancomycin, Inj. Ceftriaxone, Inj. piperacillin & and Tazobactam were found to be frequently used antibiotic post infection.

A study conducted by Nazan Atalan, Osman Fazliogullari et al. T. Amoxicillin and clavulanic acid, Inj. Cephazolin, Inj. Ofloxacin, Inj. meropenem, Inj.Vancomycin, Inj. Kephazone S Forte is the drug that is mostly used in most developed countries.

This gives a comparison of prescribing patterns between developed and developing countries by comparing these two studies.

CONCLUSION

Nosocomial Infections are an important problem in ICUs due to high incidence, complications, multi-drug resistance, and mortality rate. The most common type of infection was Surgical Site Infection and Catheter-induced Induced Urinary Tract Infection which accounts for 68% of the total studied samples in our study. Males are more prone to infection than females and above 50 years of age are found to be more prone to Nosocomial infections. S. aureus and E. coli were accountable for the most number of infections.

The path towards progress and development in the segment of Nosocomial infections are related to the consistency and enhancement of infection control programs, codification of guidelines, clinical procedures, and hospital accreditation (with quality improvement and patient safety approach), these factors can be considered effective in reducing Nosocomial infections and additionally, more research is needed to examine their effect in wider scopes. The recommendation for more attention towards the practical implications and policy-making to these programs that reduce nosocomial Iinfection should be considered.

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