



An Epidemiological Study of Nosocomial Infection in Post-Operative Patients.

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Abstract: A Nosocomial infection-also called "hospital acquired infection" can be defined as "An infection occurring in a patient in a hospital or other health care facility in whom the infection was not present or incubating at the time of admission." The term Nosocomial infection is applied to any clinical infection that was neither present nor was in its incubation period, when the patient entered the hospital. Nosocomial infections are one of the most common adverse events during healthcare delivery and a major public health issue affecting morbidity, mortality, and quality of life. At any time, up to 7% of patients in developed and 10% in developing countries will acquire at least one Healthcare-associated infection (HAI), causing a considerable economic burden to the society. It is evident that HAIs result in prolonged hospital stays, long-term disability, increased resistance of microorganisms to antimicrobials, additional cost on health systems, high cost for patients and their family, and preventable deaths. The objective of the study was to find out the morbidity pattern in post-surgical wound infections and suggested measures to minimize exogenous and endogenous sources of Nosocomial infections. Out of total 300 patient's details collected, 98 patients were affected by surgical site nosocomial infection. *Staphylococcus aureus* is found to be the leading pathogens in post-surgical wound infection. In this study, we also found that reducing preoperative stay can reduce the postoperative surgical site infection. In conclusion, we should clearly understand and identify the nosocomial infections and device a system to track, analyse, monitor prevent and treat. Hospital infection control committee should meet regularly and make recommendations at all levels for prevention of Nosocomial infections. Total prevention may not be possible but can be minimized to significant extent by implementing the guidelines developed during the present study.

Keywords: Nosocomial infection, Transmission, Hospital, Routes of infection, Infection control.

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I. INTRODUCTION

Nosocomial infections are a significant problem throughout the world and are increasing. For example, nosocomial infection rates range from as low as 1% in a few countries in Europe and the Americas to more than 40% in parts of Asia, Latin America and sub-Saharan Africa (Lynch *et al* 1997).¹ The WHO study and others also found that the highest prevalence of nosocomial infections occurs in intensive care units and acute care surgical and orthopaedic wards. Not surprisingly, infection rates are higher among patients with increased susceptibility because of old age and the severity of the underlying disease. More than 90% of reported Nosocomial infections are bacterial whereas viral, fungal or protozoan infections are less commonly involved in hospital acquired infections. This project deals with bacterial Nosocomial pathogens only since they are by far the major causes of Nosocomial infection. Infection is one of the major causes of morbidity and mortality among the patients. This is caused due to the invading microorganisms into the body. Even though there is an effective immune system in our body, in certain situations this pathogenic microorganism may overcome these barriers and cause infection.² Infection characterized by systemic side effects is called Sepsis" which may be because of pathogenic microorganism and their toxin in the blood. Our aim is to find out spread of infection in surgical wounds of postoperative patients by estimating incidence of such breaks and suggest preventive guidelines for minimizing nosocomial infection in hospitalized patients. Thus, our objective was to have a baseline study for prevalence of Nosocomial infection in post-surgical wounds, to find out the various organisms that caused the nosocomial infections, to recommend efficacious management of surgical wound infections. And to recommend procedure for prevention and control of Nosocomial infection in Hospitals.^{3,4}

I.1 Factors to contribute NI

Many patients in hospitals 'have impaired defence mechanisms due to their disease or the therapy administered. They are, therefore, highly susceptible to infection. The hospital environment is heavily laden with a wide variety of pathogens. Patients shed them from their bodies; hospital personnel spread them through their hands and clothes. Bedding linen and utensils act as fomite equipment and many are contaminated. Pathogens are present in hospital dust and air and sometimes even in antiseptic lotions and ointments. Contamination of hospital food or water may. Cause outbreaks of infections. Major invasive procedures, diagnostic or therapeutic, are carried out only in hospitals. The slightest lapse in asepsis during these procedures can lead to infection. Hospital infections are generally more serious and refractory to treatment, as the infecting agents are resistant to most antibiotics in common use. Hospital infections are in a sense a disease of medical progress. Advances in treatment and other sophisticated medical technologies enhance the risk of infection to patients.

I.2 Transmission Of Nosocomial Infections

- In a health care environment, anyone can easily become exposed to pathogens from ill patients. And many of these microbes are especially tough; resistant to

antibiotics and other antimicrobial agents frequently used in health care establishments.

- The weekend immune system of patients who are ill is also a factor. In other words, if your immune system is busy fighting off an infection, it has fewer resources available to battle new invaders.
- Transmission of pathogens (disease causing) microbes can easily occur between sick patients and health care workers moving from room-to-room and patient to patient within the hospital.^{2,3}

I.3 Sources of Nosocomial Infections

- Patients' endogenous flora
- Patient to Patient
- Health care worker to patient
- Visitor to Patient
- Environmental sources (Air, water, food, devices)

I.4 Routes of Transmission

- Contact
- Droplet
- Form of contact transmission
- Mechanism of transfer is distinct
 - Airborne
 - Common vehicle
 - Vector borne

I.5 Types Of Hospital-Acquired Infections

- Surgical wound and other soft tissue infections.
- Urinary tract infections
- Respiratory infections
- Gastroenteritis
- Meningitis

2. MATERIAL AND METHOD

A non-invasive observational study was carried retrospectively for studying the incidence rate of Nosocomial infection. This study was conducted for one year, from 1st April 2018 to 31st March 2019. The following data were collected from the patients' medical records in the surgical department by the following process,

- Identify and selection of post-operative infected patients records for collecting the details
- Collect the lab data and other medical History through the Data collection form
- Identify the Patients who have developed Nosocomial Infection

This work was carried out in the surgical department of the tertiary care hospital at Kerala. Institutional Ethics Committee of DM. WIMS approved the project on 28 Nov 2020. About 300 patients' data were collected from the patients' medical records (including, Haematology, Biochemistry, Pathology microbiology records) retrospectively, between 1st April 2018 to 31st March 2019 were included in the study.

3. STATISTICAL ANALYSIS

AAnalysis of the collected data and representing it by application of statistical tool RStudio version 1.2. The data collected were analysed and tabulated for various pathogens and demographic details using RStudio version 1.2.

4. RESULTS

Out of total 300 patients details are collected, 98 patients are affected by surgical site Nosocomial infection (SSNI); Highest were *Staphylococcus aureus* 41.8% followed by *E. coli* 21.4%,

Klebsiella 15.3%, *Pseudomonas aeruginosa* 12.2%, *Streptococcus* 6.1% and *Beta – Haemolytic streptococcus* 3.0% The figure 1 shows the frequency of organisms isolated from surgical site.

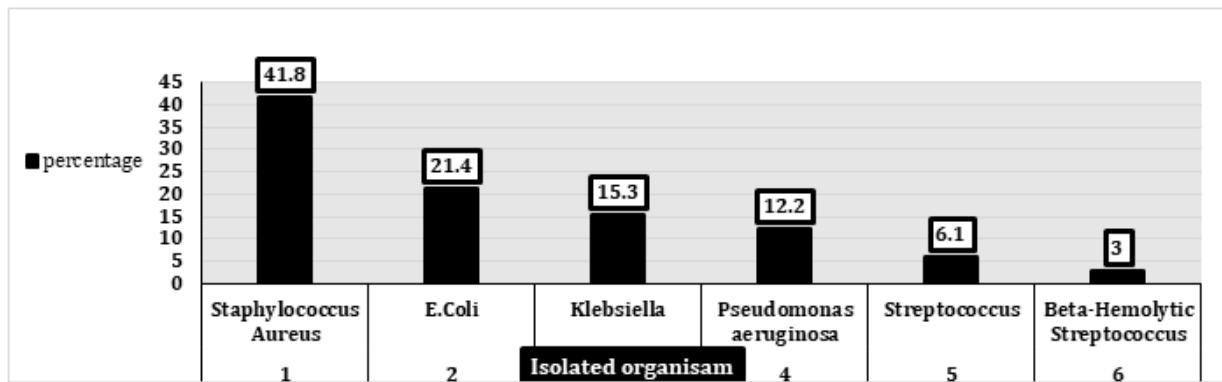


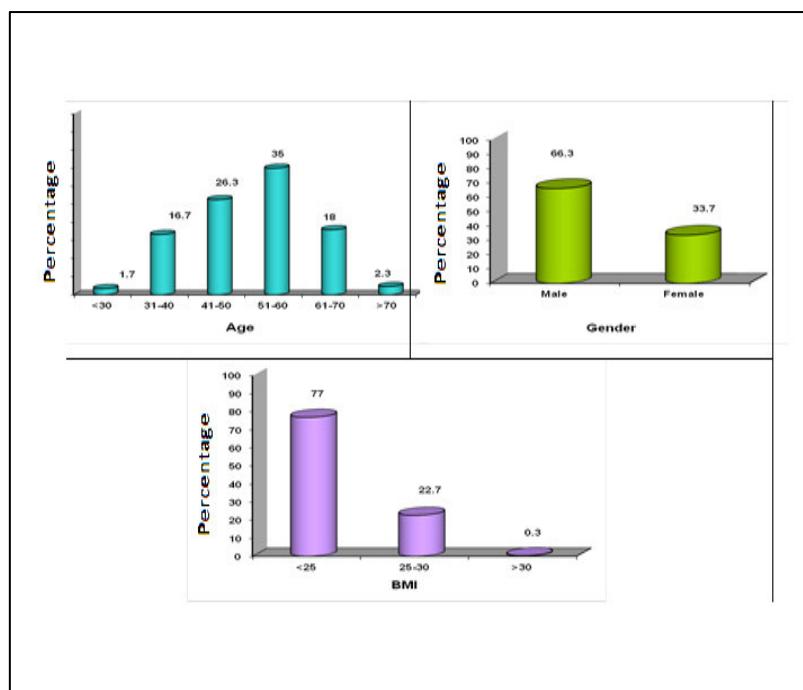
Fig 1 The diagram showing frequency of organisms isolated from surgical site nosocomial infection (SSNI).

The above figure shows that the highest number of organism caused the hospital infection were *Staphylococcus aureus* 41.8% followed by *E. coli* 21.4%, *Klebsiella* 15.3%, *Pseudomonas aeruginosa* 12.2%, *Streptococcus* 6.1% and *Beta – Haemolytic streptococcus* 3.0%.

Table 2. Demographic variables of all patients

Baseline demographic variables	Number of patients (n=300)	%
Age		
<30	5	1.7
31-40	50	16.7
41-50	79	26.3
51-60	105	35.0
61-70	54	18.0
>70	7	2.3
Gender		
Male	199	66.3
Female	101	33.7
BMI		
<25	231	77.0
25-30	68	22.7
>30	1	0.3

Table 1. The above table shows baseline demographic variables of all patients studied. The maximum number of number of cases were in between age group 51 – 60. In the patients, 66.3% were male and 33.7% female. About 231 patients were having the BMI below 25.

**Fig 2.**

The figure 2 shows the baseline demographic variables of all patients studied in this project. Out of 300 patients of SSNI collected, highest number of cases were in between age group 51 – 60, i.e., 105 cases and least were in age below 30 years. And 66.3% were male and 33.7% female. The BMI ratio 77% of patients were below 25, 22.7% patients are in between 25 to 30 BMI and 0.3% patients are above 30 BMI.

5. DISCUSSION

The risk of infection after surgery depends upon many factors including the type and length of surgical procedure: age, underlying conditions, and previous history of the patient; skill of the surgeon; diligence with which infection control procedures are applied and the type and timing of preoperative antibiotics prophylaxis^{18,19}. In our study, *Staphylococcus aureus* is found to be the leading pathogens in post-surgical wound infection. In another study conducted in Colombia, Twenty-six (10.4%) CA-MRSA (community-associated methicillin-resistant *Staphylococcus*) nosocomial infection-causing strains were detected in 250 MRSA infection isolates in mainly primary bacteraemia and surgical site infections. The mortality related to nosocomial infection by CA-MRSA was 27%.²⁰ *E. coli* was the second commonest isolate after *staphylococcus aureus*; most of the isolates were found resistant to the commonly used antibiotics. This is a matter of great concern because the treatment of such infections warrants newer and costly antibiotics. It's recommended to reduce pre and post operative stay which can reduce the postoperative surgical site infection. We can also prevent maximum Nosocomial infections by doing proper sterilization of the equipment, which are used for surgery and dressing²¹.

6. CONCLUSION

We should clearly understand and identify the nosocomial infections and devise a system to track, analyse, monitor, prevent and treat. The hospital should form a Hospital Infection Control Committee. The committee should include a wide representative from various departments. The hospital infection control committee may review the developed guidelines and implement it for the prevention and management of Nosocomial infections. Hospital infection control committees should meet regularly and make recommendations at all levels for prevention of Nosocomial infections, otherwise it will be impossible to overcome the serious issues of economic loss, drug resistance, hospital morbidity and mortality caused by Nosocomial infections. Sources of Nosocomial infections are both exogenous and endogenous in nature. It can be approved if both the sources of surgical site infections can be prevented. Total prevention may not be possible but can be minimized to a significant extent by implementing the guidelines developed during the present study.

7. AUTHORS CONTRIBUTION STATEMENT

This case report is prepared by Robin Sebastian under the guidance of Dr Gopalakrishnan. Dr Sanil Kumar and Dr Lal Prasanth reviewed and guides in all stages of my project. All authors read and approve the final version of the manuscript.

8. CONFLICT OF INTEREST

Conflict of interest declared none.

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