Original Research

Study Of Incidence And Risk Factors At Surgical Site Infections

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Abstract:
Introduction: Surgical site infections (SSI) are the commonest nosocomial infections. Despite the advances in surgical sciences post-operative wound infection remains one of the common complication which surgeons encounter. Based on NNIS system reports, Surgical Site Infections (SSIs) are the third most frequently reported nosocomial infection, accounting for 14 to 16 percent of all nosocomial infections among hospitalized patients. SSIs remain a substantial cause of morbidity and mortality among hospitalized patients

Objective: obtaining the incidence of surgical site infections and determining the factors influencing the infection rate with special reference to the NNIS risk index.

Material & Method: In this study, 89 patients who underwent various surgeries were included and various risk factors were studied. Swabs were obtained from wounds and were processed without delay using standard microbiological methods.

Result: 31.4%developed surgical site infection (SSI), The rate of infection was highest in age group of 41-50 years (33.4%). Most common organism isolated in this study was E.Coli wounds was 32.58%. Increase in pre-operative hospital stay, ASA (American Society of Anesthesiology) score > 2s, emergency surgeries, longer duration of surgery were associated with increased SSI rates. that SSI rate increases with increase in NNIS risk index.

Conclusion: The risk indices, like the NNIS risk index provide information about potential risk factors for development of SSI. A surveillance programme for SSI need to be applied by the hospital followed by auditing the infection rate on a regular basis.

Keywords: Surgical site infections (SSI), Risk factors, NNIS risk index

INTRODUCTION:

Surgical site infections (SSI) are the commonest nosocomial infections. SSI are responsible for the morbidity, mortality and significantly prolong the duration of hospitalization, thus adding the economic burden. Surgical site infections are characterized by a breach of mechanical/anatomic defense mechanisms (barriers) and are associated with greater morbidity, significant mortality, and

increased cost of care.[1] SSI rate has varied from a low of 2.5% to a high of 41.9%[2].

Despite the advances in surgical sciences post-operative wound infection remains one of the common complication which surgeons encounter. This problem if not evaluated and treated in a timely manner can have significant sequel. Pathogens that cause SSI are acquired either endogenously from the patient's own flora or exogenously from contact with operative room personnel or the environment. The period of greatest risk remains the time between opening and closing the operating site[3].

CDC developed National Nosocomial Infections Surveillance System (NNIS) risk index in the year 1991[4]. Based on NNIS system reports, Surgical Site Infections (SSIs) are the third most frequently reported nosocomial infection, accounting for 14 to 16 percent of all nosocomial infections among hospitalized patients.[5] NNIS risk index is having advantages for its ease for collecting and its objectivity and uses a procedure related cut point to indicate a long duration of surgery for an individual procedure, rather than a 2 hour cut point for all procedures[6].

One point is scored for each of the following when present:1) American Society of Anaesthesiology (ASA) physical status classification score >2, 2) Either contaminated or dirty/infected wound classification, 3) Length of operation > T hours (where T is approximate 75th percentile of duration of the specific operation being performed[7],

Among surgical patients, surgical site infections were the most common nosocomial infection, accounting for 38 percent of all such infections. Of these surgical site infections 2/3rd were confined to the incision, and one third involved organs or spaces accessed during surgery. When surgical patients with nosocomial SSI died, 77 percent of the deaths were due to infection and the majority (93%) was serious infections involving organs or spaces accessed during the operation[8]. ASA score is an index to assess overall physical status of patient before operation ranging from 1 to 5. It has been shown highly predictive for development of SSI[9].

Ambrose pare (French military surgeon 1510-1590), wound healing remained a mystery as highlighted by his famous saying, "I dressed the wound, and god healed it". Robert Koch (1843-1910) was the first to recognize the cause of infective foci as secondary to microbial growth in his postulates. Joseph Lister (1827-1912) recognized that antisepsis could prevent infection. He placed carbolic acid into open fractures to sterilize the wound and prevent sepsis.

RISK FACTORS[1,10,11]: are broadly divided as Environmental factors/Paients factors/ Treatment factors. Patient related risk factors viz. age, diabetes, prolonged preoperative hospital stay, American Society of Anaesthesiology (ASA) scores. Operative procedure related risk factors viz. nature of surgery, type of anaesthesia, duration of surgery & type of Surgical technique. Advances in infection control practices include improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis. Despite these activities, SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. The present study was aimed at obtaining the incidence of surgical site infections and determining the factors influencing the infection rate with special reference to the NNIS risk index.

MATERIALS AND METHODS:

A Descriptive Study conducted at Department Of Surgery of a Medical College and Tertiary Health Care Centre, 89 Study Participants included in the study. Patients who have undergone emergency or elective surgical procedures included in the study. Patients below 18 years and Patients not willing to give written, informed consent were excluded. For the study of risk factors and risk

indices necessary information was collected including age, Diabetes, preoperative hospital stay, ASA score, and duration of surgery. Swabs were obtained from wounds and were processed without delay using standard microbiological methods[12]

RESULTS:

89 patients were evaluated for SSI and swab for culture. Out of 89 patients 28 (31.40%) patients developed surgical site infection. In 28 SSI patients 24 (85.71) were positive culture and 04 (14.28) were culture negative. The rate of infection was highest in age group of 41-50 years (33.4%). Most common organism isolated in this study was E.Coli wounds was 32.58% while incidence rate of Pseudomonas Aeruginosa was 19.10%, that of Staph. Aureus was 17.98%, incidence rate of Klebsiella was 12.36%. Also the incidence rate of MRSA was 6.74% and that of Citrobacter was 5.61%.

The infection rate in patients having pre-operative hospital stay (Table 1) , 0-1 days was 10.25% , in patients with pre-operative hospital stay 2-6 days was 20.71% and in patients with pre-operative hospital stay 7-13 days was 36.36%
In patients with emergency surgery the infection rate was 29.16% while in patients operated electively the rate was 20% .

Table1- Correlation of Infection rate with preoperative hospital stay (Elective Patients).

Pre-Operative Hospital Stay Days	Total Number of patients	SSI Patients
0-1	19	02 (10.52%)
2-6	35	07 (20.71%)
7-13	11	04 (36.36%)

Table 2- Infection rate with ASA Score
ASA score more than 2 was associated with high rate (30.55 %,) of infection

ASA Score	Total Number of patients	SSI Patients
1	11	00
2	42	02 (4.76%)
≥3	36	11 (30.55%)

Table 3- NNIS Risk index and rate of infection
The rate of SSI increased with increase in NNIS risk index from 0 to 3 with highest rate reported in ≥2 (46.66%)

ASA Score	Total Number of patients	SSI Patients
0	42	00
1	32	05 (15.62%)
2,3	15	07 (46.66%)

In this study 23.59% patients were suffering from diabetes, 17.97% patients were obese, 5.61% patients were obese and having diabetes. Also 1.12% patients were suffering Diabetes and anaemia. A longer duration of surgery is associated with higher infection rate.

DISCUSSION:

The present study was carried out in 89 patients who underwent various surgeries. The rate of SSI varies from 2.5% to 41.9% as per different studies [2] The present study shows SSI rate 31.40%

which is comparable with rate of SSI reported by Hernandez K et al[13], (26.7%) and Umesh s et al in 2008(30.7%). A lower rate of infection is reported by Anvikar AR et al (6.1%)[14].In another study Nicola Petrosillo et al[15]. studied, surgical site infections in Italian Hospitals: a prospective multicenter study in 2008, SSI occurred in 241 (5.2%) of 4,665 patients, of which 148 (61.4%) during in-hospital and 93 (38.6%) during post discharge period.

Increasing age is correlated with greater likelihood of certain chronic conditions, malnutrition and a fall in the body immunological efficiency, causing more extensive SSI[10.] The rate of SSI was highest (33.4%) in age group 40-50 years which is comparable to other studies[16]. The more number of patients in age group of 41- 50 years in our study is perhaps due to decreased immunocompetence and increased chances of co-morbid factors like Diabetes Mellitus, Hypertension, Chronic ailments like Asthma, conditions requiring Steroid therapy and personal habits like Smoking and Alcoholism. Prolonged preoperative hospital stay is frequently suggested as patient characteristics associated with increased SSI risk. Authors[2,14] reported higher rate of SSI in patients with prolonged preoperative hospital stay. In the present study risk of SSI was increased with ASA score more than 2 (30.5%).

Culver et al[17] also reported ASA score more than 2 associated with higher rate of SSI.

Pseudomonas was most common isolate in other studies like Mofikoya Bo et all Bacterial Agents of Abdominal Surgical Site Infections in Lagos Nigeria in 2009. 25 (17.4%) of the 144 patients studied developed surgical site infections are in similar with our study.

In our study each operative procedure was divided into two groups: more than 75th percentile of NNIS duration cut point & less than 75th percentile. We found in our the higher rate of SSI with increasing duration of surgery was similar with finding of other authors[2,14] The NNIS risk index provides information about potential risk factors for development of SSI. The rate of SSI increased with increase in the risk index from 0 to 3 with highest rate reported in risk indices 2 & 3.(46.66%)

Conclusion:

A pre-existing medical illness, prolonged operating time, the wound class, emergency surgeries and wound contamination strongly predispose to surgical site infection. Reduction of length of procedures through adequate training of the staff on proper surgical techniques, proper intra-operative infection control measures and feedback of appropriate data to surgeons regarding SSIs would be desirable to reduce the surgical site infection rate. A surveillance programme for SSI need to be applied by the hospital followed by auditing the infection rate on a regular basis.

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