DOI Number: 10.5958/2320-608X.2019.00102.1

A Study of Surgical Site Infections in Rural Hospital: Assessing Risk Factors, Outcomes and Antimicrobial Sensitivity Pattern

Nivriti Singh[1], Shwetank Agrawal[2], Manisha Mishra[3], Vijay P Gupta[4], Jayanti Singh[5]

[1]Associate Professor of Department of Physiology RMCH, Bareilly. [2]Professor & Head of Department of Surgery RMRI, Bareilly. [3]Professor & Head of Department of Physiology RMCH&RC, [4]Assistant Professor, Department of Skin RMRI, [5]Assistant Professor, Department of Physiology SIMS

Abstract

Aims and objectives: This study started to estimate the incidences of SSIs and various pathogen causing SSIs. Surgical site infections can sometimes be superficial involving only skin and other more serious infections can involve deeper tissue. We included infections within 30 days of an operative procedure. We analyzed the various aspects of SSI in our institution Rajshree Medical Research Institute Bareilly which is a tertiary care hospital in Uttar Pradesh.

Materials and Method: This prospective study was conducted in the department of general surgery RMRI Bareilly UP India. A total number of 245 patients were admitted for surgical procedures. All minor, elusive, emergency, laparoscopic procedure were included. Data is analyzed statistically. The center of disease control and prevention, USA criteria were used for defining the wound. Sample swabs were collected from the first dressing and up to 30 days postoperatively.

Results: This research showed that probability of nosocomial infections increased during hospitalization . The mean duration of hospital stay in patients with SSIs was 09 days.

Conclusion: SSIs have been major complications of surgeries. We observed comorbiality, prolonged hospital stay, drainage, all increases the probability of SSIs. Slightly low incidences of SSIs in our study are due to better setup and better infection control practices.

Keywords: *Centers for disease control and prevention criteria, surgical drains, surgical site infections.*

Introduction

According to NNIS (National nosocomial surveillance system) data SSIs are the third most common frequently reported nosocomial infections that are associated with substantial morbidity and mortality. Thus this study was taken up in RMRI Bareilly UP India to estimate the incidences of SSIs and various pathogen causing SSIs.

Corresponding auther:
Shwetank Agrawal
Professor & Head of department of surgery RMRI, Bareilly (Uttar Pradesh)- 243006
email: shwetankagrawal17@gmail.com

Defining surgical site infections: The majority of SSI became apparent within 30 days of an operative procedure according to the CDC. (The center for disease control and preventions)[1,2,3,4] or the surgical site infections surveillance service [10]. CDC level describes three levels of SSI:

1. Superficial incisions: Affecting skin and subcutaneous tissue.

2. Deep incisions: Affecting the fascial and muscle layers.

3. Organ or space infection: Involves any part of the anatomy other than the incision that is opened or manipulated during the surgical procedure. For example joints and peritoneum. It is proved that the SSIs are the

most common infections among all infections.[4]

US National research council group developed a systematic classification for operative infections which was based on degree of microbial contamination.[5] Gram positive bacteria such as S.aureus are the most common causative skin dwelling micro-organisms. SSIs also caused by organisms within the patient's body that are exposed during surgery. SSIs becomes hazards in the hospitals now a days[2, 3]

Materials & Method

Hospital setting and study design

This study included patients undergoing surgery at RMRI tertiary care academic medical center, Bareilly. Hospital has active infection control surveillance programs.

This study was approved by ethical committee RMRI. This was a cohort study on all the patients who underwent surgical procedure during this period. The detailed history regarding patients associated type of surgery (emergency and elective) pre and post-operative hospital stay, duration and order of surgery, presence of surgical drains and its duration were recorded in the individual proforma.

Samples in the form of swabs were collected aseptically at the time of first dressing, 8-10 days, and then 1-3 weeks after the surgery from the wounds having serous or purulent discharge showing signs of inflammation.

All the samples were analyzed aerobically and anaerobically. One swab was used to smear and gram staining was done to ascertain the morphological form of bacteria present. The other swabs were cultured on blood agar and Mac Conkey's agar. The causative agents were identified. Antibiotic sensitivity pattern of the isolates was done by the modified stokes disk diffusion method. Antibiotic sensitivity pattern were observed, analyzed, and recorded. Patients were followed up for a period of 20 days after the surgical procedure. The observations were recorded. All the results were analyzed by the student's test for age, duration of hospitalization, elective and emergency surgery, wound classification criteria, (CDC) duration of surgery drainage and duration of surgery.

Observations:

Culture and Sensitivity

E.coli and staphylococcus aureus were isolated in all 98 SSIs patients among a total number of 1245 surgeries. Patients infected by E.coli were 24.84%. Patients infected by anaerobes were 40%. Patients infected by S.aureus were 31.91%. Patients infected by pseudomonas aeruginosa were 16.96%. Patients infected by Klebsiella were 5.99%. Patients infected by Electrococcus faecalis were 18.01%.

Table-1: Duration of hospital stay

Serial Number	Length of stay	Number of patients (1245)	Non infected patients(1147)	Number of SSIs(98)
1	1 day	596	572	24 (4.11%)
2	1-7 days	456	425	31 (7.01%)
3	>7 days	193	150	43 (19.99%)

X2=68.122; df=2; P<0.05

Results & Discussion

98 patients developed SSIs. Surgery was performed in 1245 patients. The infection rate was 7.89%. A research showed that probability of nosocomial infections increased during hospitalization [8]. In our study the mean duration of hospital stay in patients with SSIs was 09 days. This study showed that the duration of preoperative hospital stay is directly proportional to the SSIs. Result of our study matched the reported inferences. Several studies reported association between the rate of SSIs and duration of operation and order of operation. Mahesh et al also proved association between

this .[4] Another study shown that Staphylococcus aureus followed by Pseudomonas aeruginosa were the most common bacteria causing wound infections in children, these are also the predominant pathogens in adult causing wound infections [6]. Data of our study has shown that the duration of hospital stay is directly proportional to the SSI as another study results showed almost same results. The infection rate was less in patients who received pre-operative antibiotics and the most common isolate in clean surgical wounds was Klebsiella pneumoniae followed by Staphylococcus aureus and Pseudomonas aeruginosa, suggesting the emergence of K. pneumoniae as a hospital acquired pathogen[7]. A study showed that overall SSI rate was estimated to be 30.7%; 5.4% for clean, 35.5% for clean-contaminated, and 77.8% for contaminated operations. Seventy-nine per cent of the isolates were gram-negative and almost 64% demonstrated polyantimicrobial resistance.[8] Surgical site infections rates were also compared in several studies . INICC and CDC-NHSN reports, respectively: 4.3% for coronary bypass with chest and donor incision (4.5% vs 2.9%); 8.3% for breast surgery (1.7% vs 2.3%); 6.5% for cardiac surgery (5.6% vs 1.3%); 6.0% for exploratory abdominal surgery (4.1% vs 2.0%), among others. In most types of surgical procedures, surgical site infections rates were higher than those reported by the CDC-NHSN, but similar to INICC.[9] A study conducted in tertiary care hospital in Mumbai, India on the incidences of Surgical Site Infections (SSI) and risk factors affecting SSI . in This study 1000 patients underwent various surgeries and the risk factors were studied[11]. Swabs obtained from wounds were processed using standard microbiological methods. The Overall SSI rate was 9.6% (96/1000). Reslts shown that SSIs rate is increased with Age >50 years, low immunity, diabetes mellitus, emergency surgery, presence of drain, surgical wound class, longer duration of surgery. The most common organism isolated is S.aureus (22/96) followed by E.coli (20/96).[11] .Another study conducted on 300 patients. Several factors like host factors, wound factors and surgery related factors that cause SSI were studied[12]. Swabs were collected from the infected surgical wounds. . Antimicrobial susceptibility was done by Kirby-Bauer disc diffusion method. Escherichia coli (31.25%) was the commonest pathogen, followed by Pseudomonas aeruginosa (25 %) and Staphylococcus aureus 22%. The incidence of SSI are most likely same as our study.[12] . Infected wounds were studied bacteriologically in other study[13]. Samples such as pus swabs from the infected wound site, aspirates, surgical drain tips or blood were collected . Direct staining, aerobic bacterial cultures and identification followed by antibiotic sensitivity testing were performed and the results showed that the overall infection rate was 7.44% among 685 patients . A higher SSI rate was observedin cases of emergency surgeries and with increasing degree of wound contamination.[13]

Conclusion

SSIs have been a major complications of surgeries. We observed comorbiality, prolonged hospital stay, proper drainage, culture sensitivity all increases the probability of SSIs. Slightly low incidences of SSIs in our study are due to better setup and better infection control practices. This study is an important advancement towards the knowledge of surgical site infections epidemiology in the Indian hospitals set up. . To decrease the incidence of SSI we would have to: a) less duration of hospital stay (b) focus on regular and intensive drain care c) identify risk factors (d) should done periodic surveillance to keep a check on SSI. Prolonged duration of surgery and drain usage increases SSI. The most common isolate was E. coli followed by S. aureus. A Gram-negative bacteria in causing infection was also identified.

Ethical Clearance: This study was approved by institutional ethics committee.

Source of Support: Nil.

Conflict of Interest: None

References

1. Ganguly Ps khan Y. Malik. Nosocomial infection and hospital procedures. Indian J common med 2000; 25:990-1014.
2. Lilani SP Jangale N, Chaudhary A, Daver GB. Surgical site infection in clean and clean-contaminated cases. Indian J med Microbial 2005 Oct; 23 (4):249-252.
3. Horan TC, Gaynes RP Martone WJ, Javier WR, Emori TG. CDC definition of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections.
4. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guidelines for prevention of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee .Infect Control Hosp Epidemiol 1999 April; 20(4):250-278.

5. Agarwal SL. Study of postoperative wound infections. Indian J Surg 1972:314-320.
6. Anvikar AR ,Deshmukh AB, Karyekarte RP, Damle AS, Patwardhan NS, Malik AK, Bichile LK, Bajaj JK, Baradkar VP, Kulkarni JD, et al. A prospective study of 3280 surgical wounds. Indian J med Microbial 1999 Jul; 17(3):129-132.
7. Kamat US, Fereirra AM, Kulkarni MS, Motghare DD. A prospective study of surgical site infections in a teaching hospital in Goa. Indian J Surg 2008 Jun; 70(3):120-124.
8. Singh S, Chakravarthy M, Rosenthal VD, Myatra SN, Dwivedy A, Bagasrawala I, Munshi N, Shah S, Panigrahi B, Sood S, et al. surgical site infections rate in six cities of India: Findings of the International nosocomial Infection Control Consortium (INICC). Int Health 2015 Sep; 7(5):354-359.
9. Singh AK, Nath U. surgical site infections in abdominal surgeries in the tertiary Centre. Indian J Apple Res 2016 Mar; 6(3):617-618.
10. Mahesh CB, Shivkumar S, Suresh BS, Chidanand SP, Vishwanath Y. A prospective study of surgical site infections in a teaching hospital. J Clin Diagn Res 2010Oct; 4(5):3114-3119.
11. Shahane V, Bhawal S, Lele U. surgical site infections: A one year prospective study in a tertiary care center. Int J Health Sci (Qassim) 2012 Jan; 6(1):79-84.
12. Kakati B, Kumar A, Sachan PK, Gupta P, Thakuria B. surgical site abdominal wound infections: experience at a north Indian tertiary care hospital. JIACM 2013; 14(1):13-19.
13. Salu Rai, Uday Narayan Yadav,Narayan Dutt Pant, Jaya Krishna Yakha,Prem Prasad Tripathi, Bacteriological Profile and Antimicrobial Susceptibility Patterns of Bacteria Isolated from Pus/Wound Swab Samples from Children Attending a Tertiary Care Hospital . International Journal of Microbiology 2017(5)Article ID 2529085,https://doi.org/10.1155/2017/2529085