



SURGICAL SITE INFECTION AMONG PATIENTS FOLLOWING VARIOUS SURGERIES AT A TERTIARY CARE HOSPITAL, PUNE.

Dr. Omair Aziz Wani

Senior Resident, Department of Community Medicine, Govt. Medical College Srinagar

ABSTRACT

Introduction:- Nosocomial infections are an important public health problem worldwide. Surgical site infections (SSIs) are known to be one of the most common causes of nosocomial infections worldwide and account for nearly one fourth of all the nosocomial infection cases.

Objectives:- 1) To estimate the incidence of SSI among patients undergoing various emergency/ elective surgeries at a tertiary care hospital. 2) To determine the risk factors responsible for development of SSI. 3) To identify the various pathogens involved from the infection site causing SSI

Material and method:- The study was undertaken at surgical wards of different departments of Bharati hospital, Pune. A total of 222 patients were studied.

Results:- The incidence of SSI in the current study was 5.6%. Comorbidities and presence of drain were observed to be the significant contributors for the development of SSI. Coagulase negative Staphylococcus and E. coli were the most frequent microbes isolated from SSI wound site.

KEYWORDS : Surgical site infection, surgical ward, Coagulase negative Staphylococcus

INTRODUCTION

Nosocomial infections, also called hospital acquired infections, are infections acquired during hospital care which is not present or incubating at admission¹. Nosocomial infections are an important public health problem worldwide. These infections result in substantial mortality and increased financial burden. The socio economic impact, i.e. prolongation of hospitalization, mortality and cost of these infections adversely affects patients and nation's economic wellbeing².

Surgical site infections (SSIs) are known to be one of the most common causes of nosocomial infections worldwide and account for nearly one fourth of all the nosocomial infection cases. Surgical site infection rates are reported to range from 2.5% to 41% globally³. For an SSI, microbial contamination of the surgical site is a prerequisite. The risk of SSI is markedly increased when a surgical site is contaminated with $>10^5$ microorganisms per gram⁴.

OBJECTIVES

- To estimate the incidence of SSI among patients undergoing various emergency/ elective surgeries at a tertiary care hospital.
- To determine the risk factors responsible for development of SSI.
- To identify the various pathogens involved from the infection site causing SSI.

Study Design

Prospective observational study

Study Area

Wards of General surgery, Orthopaedics and Gynaecology & Obstetric departments of Bharati hospital, Pune

Study Subjects

All patients with clean and clean contaminated surgical wounds following various emergency/ elective surgical, orthopedic and gynecological & Obstetric surgical procedures done at the same hospital

Inclusion criteria

Patients with clean and clean contaminated surgical wounds
Patients with no previous history of infection at the surgical site.

Exclusion criteria

Patients who died within 30 days after surgery
Patients/relatives who didn't have mobile phones.
Patients who did not come for follow up to the hospital on developing signs of infection within 30 days of surgery.

Study Duration

Three months i.e. from 1st April 2017 to 30th June 2017

Sample Size

Sample size was calculated using formula, $n = 4pq/L^2$, where $p = 32\%$.³ L is allowable error = 20% of p. Therefore $n = 4 \times 32 \times 68 / (6.4)^2 = 212.5$.

Total of 222 cases were taken.

OPERATIONAL DEFINITIONS

Surgical Site Infection

Surgical site infection is defined as any purulent discharge, abscess or spreading cellulites at the surgical site during the month after the operation¹

Surgical Wound Classification

Surgical wounds were classified as clean, clean contaminated, contaminated and dirty as per CDC guideline for prevention of surgical site infection, 1999.⁵

Surgical wound infection

Diagnosed if any one of the following criteria was fulfilled:

- a) Serous or non-purulent discharge from the wound.
- b) Pus discharge from the wound.
- c) Serous or non-purulent discharge from the wound with signs of inflammation (edema, redness, warmth, increased local temperature, fever $> 38^\circ\text{C}$, tenderness).⁶

DATA COLLECTION

Institutional Ethics Committee permission was sought before the start of study. Proforma was prepared, pretested and finalized. Operation theatre was visited daily, records of the patients were obtained and patients were interviewed/ examined in wards by interview technique after taking written consent from the patients. Clinical chart/ surgical wound was inspected at the time of first dressing and at least once till the date of discharge. At the time of discharge, the patient's mobile number was taken and weekly calls were made to inquire about the status of surgical site. The patient was requested to contact hospital if any complication at surgical site (Abscess, Purulent discharge, edema, redness, warmth, increased local temperature and tenderness) develops and he/she was reexamined on visit to the hospital. All patients

were followed on 30th day following surgery by contacting the patients through mobile phone. Purulent discharge, if any, collected from the surgical site was processed using standard procedures followed by the hospital. Microbiological report was reviewed and results were noted accordingly

Data Analysis

Data analysis was done by using SPSS 20.0 statistical software. Qualitative data was expressed by using frequency and percentage. Chi-square test and Fishers exact test was used to correlate various variables with occurrence of SSIs. P-value <0.05 was considered as significant with two tailed test

Results and Discussion

The present study was carried out among 222 patients who had undergone various surgeries.

Table 1 reveals the sociodemographic distribution of the patients. There was a female preponderance with females comprising of 55% of all the cases and rest (45%) cases were males.

As far as age is concerned, majority (39%) of the patients were middle aged belonging to the age group of 41-60 years followed by 31% of patients who belonged to the age group of 19-40 years.

Regarding the representation of occupation, 60 (27%) of cases were students followed by 53 (24%) cases who were salaried.

Out of total 222 surgical cases studied in our study, majority (150) of them constituted the abdominal surgeries followed by urogenital surgeries (39). **Fig: 2**

Table 1: Socio demographic distribution of operated patients (n= 222)

Characteristics	Number (%)
Gender	
Male	99(45)
Female	123(55)
Age Group (years)	
≤ 18	20 (9)
19 – 40	68 (31)
41 – 60	87 (39)
≥61	47 (21)
Education	
Illiterate	24(10)
Primary	81(37)
Secondary	75(34)
Graduate or above	42(19)
Occupation	
Salaried	53 (24)
Unemployed	12 (5)
Business	42 (19)
Labourer	25 (11)
Student	60 (27)
Housewife	15 (7)
Agriculture	15 (7)

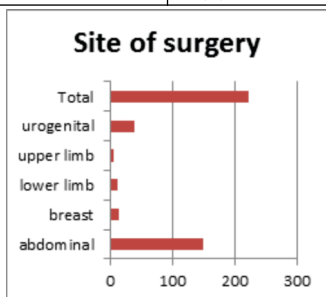


Fig: 1 Incidence of Surgical Site Infection

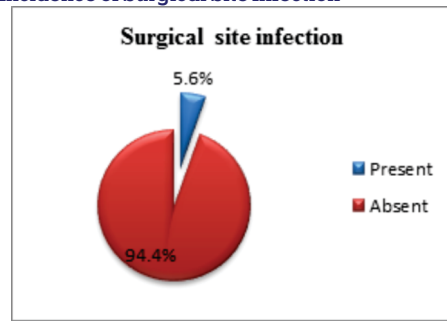


Fig: 2 Site of surgery (Total=222)

Infection rate of a hospital is an indicator of the overall quality of health care system of the institution.

The incidence of SSI in the current study was 5.6% which is in line with the Surgical site infection rates reported globally ranging from 2.5% to 41%.³

In concordance to the current study **Pathak A et al.**¹³ observed an incidence of SSI to be 5%.

Gupta P et al. in their study observed an incidence of Surgical site infection rate to be 32%.⁸

The difference between the infection rates of the current study (5.6%) and the study conducted by **Gupta P et al.** (32%) could be related to the selection criteria of study population. Our study has included patients with clean and clean contaminated surgical wounds where as the latter study included patients with clean, clean contaminated, contaminated and dirty wounds

Table: 2 Surgical Site Infection vs risk factors (n=222)

Variables	SSI present	SSI absent	Total	P value
Drain				
present	6	15	21	<0.05
absent	6	195	201	
Surgery type				
elective	10	192	202	>0.05
emergency	2	18	20	
Wound type				
clean	2	28	30	>0.05
clean contaminated	10	182	192	
Co morbidity				
present	9	27	36	<0.05
absent	3	183	186	

There are numerous patient-related (endogenous) and process/procedural related (exogenous) risk factors that can affect a patient's risk of developing an SSI.¹²

Table: 2 depict the relationship of Surgical site infection with various risk factors. Comorbidities like diabetes mellitus, hypertension and anaemia had a significant association with the development of SSI. This could be accredited to the impaired wound healing in the presence of comorbidities. Diabetes causes vasoconstriction and affects circulation of tissue leading to local tissue hypoxia.¹²

Findings of the current study suggest that there is a significant increase in the surgical site infection rate with presence of drain which is in accordance to the findings of the studies conducted by **Mekhla et al.**¹¹ and **Fadnis MP et al.**¹²

Similar findings were revealed by **Maksimović J et al.**¹¹ and **Ramasubramanian V et al**⁹ who observed that presence of

drain and co morbidity like Diabetes has a significant relationship with the development of SSI.

In our study a lower rate of SSI was observed amongst patients undergone elective surgeries compared to the emergency ones, however the difference wasn't statistically significant ($P < 0.05$).

Similar observation was made by **Ramasubramanian V et al**⁹ on SSI rates being low in elective surgeries compared to emergency procedures while conducting a review of literature on SSIs in India.

Kumar A et al.¹⁰ and **Mekhla et al.**¹¹ in their studies observed a significant difference in SSI incidence among elective and emergency surgeries

Table: 3 Organisms isolated from SSI site

Organisms	Frequency	Percentage (%)
Coagulase negative Staphylococcus	5	2.3
Ecoli	3	1.3
Enterococcus	2	1
Staphylococcus Aureas	2	1
Total	12	5.6

Table 3 reveals the frequency of organisms isolated from SSI wound site. Coagulase negative Staphylococcus and Ecoli was isolated from surgical sites of 5 and 3 patients respectively.

Globally, *S. aureus* tops the list of pathogens isolated from SSI, followed by CoNS, Enterococcus sp, *E.coli*, *P. aeruginosa*, and Enterobacter sp.⁹

Maksimović J et al.⁶ while studying SSIs amongst patients undergone orthopaedic surgery found Staphylococcus aureus, Acinobacter spp and Klebsiella/Enterobacter sp to be responsible for more than 50% of SSI cases.

Lilani SP et.⁷ in their study identified Staphylococcus Aureas as the commonest isolate from surgical site infection wound.

Staphylococcus aureus was the predominant organism isolated from the surgical sites followed by Pseudomonas and Klebsiella in the study conducted by **Shetty NHK et al.**¹⁴

CONCLUSION

In the current study the incidence of surgical site infection was noticed to be 5.6%. Risk factors like presence of drain and comorbidities were observed to be significantly associated with the development of SSI.

Recommendations

Surveillance is the heart of infection prevention and control. It is imperative to regularly monitor the pattern of microbial growth based on which an antibiotic policy should be framed. Infection control measures like environmental cleaning; raising awareness amongst hospital staff on SSI, infectious waste and sharp disposal should be adopted.

REFERENCES:

1. Park K. Leprosy. Park's Text Book of Preventive and Social Medicine, 22nd edition. Jabalpur: Banarsidas Bhanot publishers; 2013: 332.
2. Ginawi, Saleem M, Sigh M, Vaish AK, Ahmad I, Srivastava VK, Abdulla AFM. Hospital acquired infections among patients admitted in the medical and surgical wards of a non-teaching secondary care hospital in northern India. Journal of Clinical and Diagnostic Research 2014 Feb; 8(2):81-2.
3. Post-operative surgical site infection in a surgical ward of a tertiary care hospital in northern Ghana. Available at http://www.ijmhs.net/articles/1381563780Epidemiology_of_Wound_Infection_in_A_Surgical_Ward_of_a_Tertiary_Care_Hospital_in_Northern_Ghana.pdf. Accessed on 10 October 2016.
4. Ramasubramanian V, Iyer V, Sewlikar S, Desai A. Epidemiology of healthcare acquired infection – An Indian perspective on surgical site infection and catheter related blood stream infection 2014 September; 3(4): 46–63.
5. Guideline for prevention of surgical site infection, 1999. Available at

6. http://www.cdc.gov/hicpac/SSI/001_SSI.html. Accessed on 6 October 2016.
7. Surgical site infection among post-operative patients of tertiary care center in central India- A prospective study. Available at <http://www.jbiopharm.com/index.php/ajbps/article/viewFile/187/156>. Accessed on 28 June 2017.
8. Pathak A, Erika A, Saliba RN, Sharma S, Mahadik VK, Shah H, Lundborg CS. Incidence and factors associated with surgical site infections in a teaching hospital in Ujjain, India. American Journal of Infection Control 2014; 42(1): 11–15.
9. Gupta P. A study of effect of antibiotics after culture and sensitivity of surgical sites infection cases in a medical college. International Journal of Biological and Medical Research 2013; 4(3): 3275- 77.
10. Fadnis MP, Desai S, Kagal A, Bharadwaj R. Surgical site infections in tertiary care hospital. International Journal of Healthcare and Biomedical Research 2014; 2(3):152-161.
11. Mekhla, Borle FR. Determinants of superficial surgical site infections in abdominal surgeries at a Rural Teaching Hospital in Central India : A prospective study. Journal of Family Medicine and Primary Care 2019; 8:2258-63.
12. Maksimović J, Denić LM, Bumbaširević M, Marinković J, Vlajinac H. Surgical Site Infections in Orthopedic Patients : Prospective Cohort Study. Croat Medical Journal 2008; 49:58-65.
13. Kumar A, Rai A. Prevalence of surgical site infection in general surgery in a tertiary care centre in India. International Surgery Journal 2017 Sep; 4(9):3101-06.
14. Lilani SP, Jangale N, Chowdhary A, Daver GB. Surgical site infection in clean and clean contaminated cases. Indian Journal of Medical Microbiology 2005; 23 (4): 249-52.
15. Setty NKH, Nagaraja MS, Nagappa DH, Giriyaiah CS, Gowda NR, Naik RDML. A study on Surgical Site Infections (SSI) and associated factors in a government tertiary care teaching hospital in Mysore, Karnataka. International Journal of Medicine and Public Health Apr-Jun 2014; 4(2): 171-75.