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Original Research Article

A study of surgical site infections in a general practice hospital

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ABSTRACT

Background: Surgical site infections (SSI), major contributor to increased morbidity, mortality and healthcare costs among surgical patients worldwide. This study evaluates the incidence of surgical site infections in abdominal surgeries.
Methods: This prospective observational study was conducted at Siri hospital, Khammam after obtaining permission from the hospital ethics committee. A total of 250 patients of elective and emergency abdominal surgery were included and studied about surgical site infections and factors influencing it.
Results: This study includes 250 patients with abdominal abnormalities. In this 48(19.2%) patients were recorded with surgical site infection. As the age increases SSI was also increases. ASA scores of III (5.6%) & IV (8.0%) were associated with the increased SSI. These SSI were more common in intestinal obstruction with gangrene cases 7 (2.8%) and also in accidental trauma/injury cases 7 (2.8%). SSI can be noticed after 48 hour of infection and recorded up to 10 days of postoperative period. The surgical wound incidence was clean (14.6%), clean contaminated (29.2%), contaminated (20.8%) and dirty (35.4%) respectively. Major factors that influence the SSI were diabetes, obesity, pre-operative anti biotic usage, duration of surgery, emergency surgery and level of haemoglobin and albumin levels. The organisms isolated from SSI were *E.coli* (22.9%), *Methicillin Resistant Staphylococcus aureus* (18.7%), *Proteus* species (16.6%), *Klebsiella* species (16.6%), *Pseudomonas aeruginosa* (8.3%), *Staphylococcus aureus* (6.2%) and mixed bacterial infections (10.4%).
Conclusions: Surgical site infections were more commonly seen in abdominal surgeries. SSI was higher in older people. Control of factors influencing and bacterial contamination decreases the incidence of SSI in abdominal surgeries.

Keywords: Surgical site infection, Age, Incidence, Factors, Bacteria

INTRODUCTION

Surgical site infection (SSI) is defined by the centre for disease control and prevention as a wound infection that occurs within 30 days of an operative procedure or within a year if an implant is left in place and the infection is thought to be secondary to surgery.[1]

Surgical site infection (SSI) is a large health burden for patients and health-care providers. It is the most common postoperative complication and causes pain and suffering to patients.[2,3] SSI is, a preventable HCAI, that can double the length of hospital stay and increase the costs of healthcare, There are, in addition, indirect costs due to loss of productivity, patient dissatisfaction and litigation, and reduced quality of life.[4]

According to a report by the International Nosocomial Infection Control Consortium (INICC) in 2012, overall 1.4 million people worldwide were suffering from

nosocomial infections, and in India alone, the rate was over 25 per cent, with SSI occupying a significant share. SSIs are associated with considerable morbidity and over one - third of postoperative deaths are related, at least in part, to SSIs.[5]

Surgical site infections are a common cause of morbidity and mortality following major abdominal surgeries. Infections can occur in emergency and elective surgeries and can occur in superficial skin and subcutaneous planes to deep infections and can occur very early in the post-op period to very late after discharge of patients. The rates of SSI are much higher with abdominal surgery than with other types of surgery, with several prospective studies indicating an incidence of 15%-25% depending on the level of contamination.[6,7]

The aim of this study is to know the incidence of SSI in abdominal surgeries and risk factors associated with SSI in a tertiary care hospital.

METHODS

This prospective observational study was conducted at Siri hospital, Khammam after obtaining permission from the hospital ethics committee. Written consent was taken from all patients. This sudy was conducted from January 2017 to December 2018. A total of 250 patients admitted to the surgical wards for elective surgery, and emergency ward for emergency surgery were included in this study. Inclusion criteria was all the patients with SSI after abdominal surgeries, aged between 10 to 70 years both sexes. Exclusion criteria were patients of critical illness and neurological disorders and more than 70 years age. Patient history was collected at the time of joining. The demographic data like age, weight, height, sex, were recorded. The risk factors associated with the SSI like obesity, diabetes, hypertension, smoking habits, immune competence were noted. At the time of surgery duration of surgery, use of prophylactic antibiotics, wound contamination class, surgical type and approach were recorded. Outcome of surgery like SSI, organisms involved, hospital stay analysed. In all elective surgery cases antibiotics were before surgery. All the outcome values were given in percentages.

RESULTS

This study includes 250 patients with abdominal abnormalities. In this 118 patients went for emergency surgeries and 132 members were done with elective surgeries. In this 48 (%) patients were recorded with surgical site infection. Demographic data was shown in Table 1. Age wise incidence, sex wise incidence was shown in Table 2 and 3.

The age wise incidence of SSI was higher in the above 56 years people, as age increases SSI occurrence also increased (Table 2).

Table 1: Demographic data.

Parameter	Patients
Number of patients included	250
Average age in year	35.28±20.36
Average height in cm	150.63±5.23
Average weight in kg	55.23±12.36
BMI	25.32±5.89
Sex (male/female)	128/122

Table 2: Age wise incidence.

Age in years	SSI	No SSI
	N (%)	N (%)
16-25	3 (1.2)	47 (18.8)
26-35	6 (2.4)	43 (17.2)
36-45	9 (3.6)	41 (16.4)
46-55	14 (5.6)	36 (14.4)
56-70	16 (6.4)	34 (13.6)
Total	48 (19.2)	202 (80.8)

3. Sex wise incidence.

Sex	SSI	No SSI
	N (%)	N (%)
Male	22 (8.8)	108 (43.2)
Female	26 (10.4)	94 (37.6)

Both males and females were also infected with SSI and there was no priority regarding sex.

Table 4: ASA score.

ASA score	SSI	No SSI
	N (%)	N (%)
Class I	6 (2.4)	70 (28)
Class II	8 (3.2)	66 (26.4)
Class III	14 (5.6)	42 (16.8)
Class IV	20 (8.0)	24 (9.6)

SSI was higher in the ASA class IV followed by class III, II and I.

This current study includes SSI in patients after different type of surgical operations. These SSI were more common in intestinal obstruction with gangrene cases 7 (2.8%) and also in accidental trauma/injury cases 7 (2.8%).

The duration of surgery in 180(%) patients was below 2hours, and in 70 (%) patients it was more than 2hours.

The surgical wounds were classified according to the CDC classification (Table 6). The surgical wound incidence was clean (14.6%), clean contaminated (29.2%), contaminated (20.8%) and dirty (35.4%) respectively.

Table 5: Type of surgeries

Type of surgery	SSI	No SSI
	N (%)	N (%)
Incisional hernia	2 (0.8)	10 (4.0)
Umbilical hernia	3 (1.2)	25 (10.0)
Appendicectomy for acute appendicites	6 (2.4)	28 (11.2)
Colostomy	5 (2.0)	15 (6.0)
Gb stone	4 (1.6)	16 (6.4)
Intestinal obstruction with gangrene	7 (2.8)	14 (5.6)
Intestinal obstruction without gangrene	2 (0.8)	18 (7.2)
Resection and anastomosis intussusception	4 (1.6)	16 (6.4)
Intestinal perforation	5 (2.0)	20 (8.0)
Splenectomy	2 (0.8)	8 (3.2)
Cholecystectomy	1 (0.4)	10 (4.0)
Trauma/injury	7 (2.8)	22 (8.8)

Table 6: Surgical wound classification.

Wound type	Number	%
Clean	7	14.6
Clean -contaminated	14	29.2
contaminated	10	20.8
Dirty-infected	17	35.4
Total	48	100

The SSI was started at 48 hours after surgery and can be noticed up to 1 week. Increased duration of surgery also contributes to the surgical site infection. There were different factors that influences the SSI were shown in Table 7.

Table 7: Factors affecting surgical site infections.

Factor	Number	%
Obesity	7	14.5
Diabetes	14	29.1
HB <10 GM%	8	16.6
Albumin	9	18.7
Cancer	2	4.1
HIV	3	6.2
Smoking	15	31.2
Hypertension	17	35.4
Steroid usage	8	16.6
Duration of surgery >2 hr	24	50.0
Foreign material in suture site	12	25.0
Wound irritation	5	10.4
Emergency surgery	32	66.6
Elective surgery	18	37.5

Major factors that influence the SSI were diabetes, obesity, pre-operative anti biotic usage, duration of surgery, emergency surgery and level of haemoglobin and albumin levels.

Table 8: Organisms isolated from surgical site infections

Organisms isolated	No of cases	%
E.coli	11	22.9
Methicillin resistant Staphylococcus aureus	9	18.7
***Proteus* species**	8	16.6
***Klebsiella* species**	8	16.6
Pseudomonas aeruginosa	4	8.3
Staphylococcus aureus	3	6.2
Mixed infections	5	10.4

The organisms isolated from SSI were *E.coli* (22.9%), *Methicillin Resistant Staphylococcus aureus* (18.7%), *Proteus species* (16.6%), *Klebsiella* species (16.6%), *Pseudomonas aeruginosa* (8.3%), *Staphylococcus aureus* (6.2%) and mixed bacterial infections (10.4%). Based on organisms isolated, antibiotic sensitivity test was done medication was subscribed to patients with SSI. No deaths were recorded during the study period of 30 days.

DISCUSSION

Surgical site infections alter the outcome of surgery; They complicate the post-operative course of a significant proportion of abdominal surgical patients, are associated with excessive health-care costs, increased morbidity and mortality, and may require further hospital admissions, IV antibiotics and even surgical re intervention.

In this study a total of 250 patients were included. Out of these 250, 48 were having surgical site infection. Different studies have shown rates ranging from 6.09 to 38.7%, with the majority of studies having a rate of 14-17%. The incidence was compatible with other reports.[8,9]

In our study incidence of SSI increased with age**.** Most studies in literature show an increase in the incidence of SSI with increasing age, probably reflecting the deteriorating immune status and development of co-morbidities with age.[10]

In this study increased SSI was observed with emergency surgeries. The high rates of infection in emergency surgeries can be attributed to inadequate pre-operative preparation, the underlying conditions and the greater frequency of contaminated or dirty wounds in emergency surgeries. This is in conformity with other studies.[10]

Obesity is positive correlation with SSI. Allaire et al reported that the use of closed suction drainage in the subcutaneous space might reduce the incidence of postoperative site complications (including incisional SSI) in obese women who have at least 2 cm of

subcutaneous fat and undergo cesarean delivery.[11] In a study has revealed that obesity (BMI >25 kg/m^2) also is an independent risk factor for incisional SSI in emergency colorectal operations.[12]

In a study in tertiary care hospital, the overall incidence of SSI was 10.9%. The associated risk factors were found to be an increased age, ASA class, wound classification, skills and experience of the surgeon, longer duration of surgery (>2 hr), prolonged duration of hospital stay, blood transfusion and emergency surgery. The most common pathogens isolated were *Klebsiella ssp* (55%), followed by *Escherichia coli* (15%) and *Proteus ssp* (12%), *Acinectobacte*r (9%), *S. aureus* (6%) and coagulase-negative *staphylococci* (3%).[13]

In Alkaaki et al study, A total of 337 patients were included.[14] The overall incidence of SSI was 16.3% (55/337); 5 patients (9%) had deep infections, and 25 (45%) had combined superficial and deep infections. The incidence of SSI in open versus laparoscopic operations was 35% versus 4% ($p<0.001$). The bacteria most commonly isolated were extended-spectrum β-lactamase-producing *E. coli*, followed by *Enterococcus* species. Only 23% of cultured bacteria were sensitive to the prophylactic antibiotic given preoperatively.

The commonest organisms isolated from patients with SSI were gram-negative bacteria, namely extended-spectrum β-lactamase-producing *E. coli*. This finding is contrary to those in studies that revealed more gram-positive bacteria such as *S. aureus* and *coagulase-negative staphylococci*.[15,16]

CONCLUSION

Surgical site infections were more commonly seen in abdominal surgeries. SSI were common in older people and associated with ASA scores. Factors influencing SSI were diabetes, obesity, pre-operative anti biotic usage, duration of surgery, emergency surgery and level of haemoglobin and albumin levels. *E.coli* was observed in most of SSI. Control of factors influencing and bacterial contamination decreases the incidence of SSI in abdominal surgeries.

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