



## A Study of Post Operative Wound Infection After Laparotomies: our Experience

### KEYWORDS

MRSA, Laparotomies, SSI.

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### ABSTRACT

**Aims And Objectives:** To determine the incidence and types of surgical site infections following laparotomies, to study the risk factors in patients who developed SSI and to study the causative organisms and their sensitivity patterns.

**Results:** Of 450 patients who underwent laparotomies. 240 had elective procedures, 210 had emergency procedures. There was male predominance in the study. Risk factors include diabetes (most common), obesity, HB < 10 gm %, COPD, Smoking and immunocompromised status. The most commonly implicated organism in this study was MRSA accounting for 25 % of the cases of SSI, E.Coli(23%) and Klebsiella (18%).

**Conclusion:** The incidence of SSIs following laparotomies is 22.2%. Emergency laparotomies were statistically more likely to develop SSI. A large share of abdominal SSIs was occupied by surgeries with clean-contaminated wounds.

**Introduction:** Infections that occur in the wound created by an invasive surgical procedure are generally referred to as surgical site infections (SSIs). SSIs are one of the most important causes of healthcare – associated infections (HCAIs), second only to urinary tract infection (UTI) in incidence. A prevalence survey suggested that approximately 8% of patients in hospital in the UK have HCAI. SSIs accounted for 14% of these infections and nearly 5% of patients who had undergone a surgical procedure were found to have developed an SSI.<sup>1</sup> Abdominal surgical site infections are among the most common infectious complications in hospitalised patients and are associated with serious consequences for outcomes and costs. The present study aims to determine the frequency of surgical site infections in patients undergoing various abdominal surgical procedures, the associated risk factors, the organisms implicated and their sensitivity patterns, and the outcomes observed after treatment among inpatients in the general surgical wards of Osmania General Hospital, Hyderabad.

### Materials And Methods:

**Sample:** Patients admitted to surgical unit at Osmania General Hospital, Hyderabad, for laparotomy, from May 2013 to August 2014; who developed surgical site infection (SSI) were studied.

**Study design :** A prospective observation study was performed on the 450 patients who underwent laparotomies. The type of SSI, the risk factors encountered, the causative organisms isolated and their sensitivity patterns and the outcomes following treatment were studied.

**Inclusion criteria :** Patients who underwent laparotomies.

**Exclusion criteria :** Surgery other than laparotomies.

### METHODS:

**Pre-operative phase :** All patients received a prophylactic antibiotic one hour before surgery for elective surgeries and at the time of incision for emergency surgeries. The antibiotic given was a third generation cephalosporin, ceftriaxone or cefotaxime, 1 g, given intravenously. The drug used in this hospital is metronidazole, two tablets of 400 mg each given the night before surgery. All patients undergoing colorectal surgery received mechanical bowel preparation.

### Intra-operative phase

The surgical team decontaminated their hands with an antiseptic soap and povidone-iodine scrub<sup>2</sup>. Skin preparation was done by the surgeon in all cases. Preparation was done immediately before skin incision by a povidone-iodine scrub<sup>3</sup>, then cleansed with surgical spirit and coated with a 5 % povidone-iodine solution. Sterile drapes were used in two layers.

### Post-operative phase

Sterile dressings were applied over the surgical site and the wounds kept covered for 48 hours<sup>4</sup>, after which the dressing was removed with aseptic precautions and the wound left exposed to the environment. Broad-spectrum antibiotics, whether oral or parenteral, were continued for a minimum of 5 days post-operatively in all the patients<sup>5</sup>.

**Results:** Of the 450 patients who underwent laparotomies. 240 had elective procedures and 210 had emergency procedures. Data has been recorded as follows.

### A. Patient factors :

#### 1. Age :

The age had greater impact in the study with older age being more commonly infected.

**2. Sex :** There is 24 % incidence among males and 20 % incidence among females.

**3. Risk factors :** The risk factors which were included in this studies were diabetes mellitus, obesity, HB < 10 gm %, COPD. The most common risk factor with increased risk of development of SSI encountered in this study was diabetes mellitus . SSI developed in 46.6 % of diabetics.

**Table 1 : Association of co-morbid conditions with SSI**

		TOTAL (N = 450)	SSI	W/O SSI	CHI SQUARE	P VALUE
DIABETES MELLITUS	present	150	70(46.6%)	80	77.09	0.0001
	absent	300	30	270		
OBESITY	Present	154	52(33.7%)	102	18.5	0.0001
	Absent	296	48	248		
HB < 10 GM %	present	132	45(34.1%)	67	24.3	0.0001
	absent	318	55	263		
COPD	present	70	27(38.5%)	43	12.82	0.0003
	absent	380	73	307		

**4. Pus for culture and sensitivity - organisms isolated and their sensitivity patterns :** The most commonly implicated organism in this study was *MRSA (Methicillin Resistant Staphylococcus Aureus)*, accounting for 25 % of the cases of SSI, followed by *E.Coli* and *Klebsiella* species, each of which accounted 23% and 18% respectively . Other commonly encountered organisms were *Proteus* species and *Pseudomonas aeru*

**Table 2 : Organisms implicated in abdominal SSI and their sensitivity pattern**

Organism	Percentage	Sensitivity
MRSA	25 %	Vancomycin,linezolid
E.coli	23 %	Gentamicin, Amikacin
Klebsiella species	18 %	Amikacin, Cefoperazone + Sulbactam, Ceftazidime + Sulbactam
Proteus species	16 %	Amikacin, Doxycycline, Ciprofloxacin
Pseudomonas aeruginosa	12 %	Cefotaxime, Ceftazidime + Sulbactam
Staphylococcus aureus	6 %	Piperacillin + Tazobactam, Ciprofloxacin

**Table 3: Comparison of the present study with two similar studies on abdominal SSIs from developing countries**

	University Clinical Centre of Kosovo	Imam Khomeini Hospital, Iran	Present study
Number of patients who had abdominal surgery	225	802	450
Incidence of abdominal SSI	27 (12 %)	139 (17.4 %)	100 (22.2%)
SSI in emergency abdominal surgeries	11 (10.0 %)	29 (14.9 %)	60 (28.5%)
SSI in elective abdominal surgeries	16 (13.9 %)	110 (18.1 %)	40 (16.6 %)
Type of wound most often infected	Clean-contaminated (51.85 %)	Contaminated (45.8 %)	Clean-contaminated (54 %)
Surgical procedure most often infected	Elective – colorectal surgery, open cholecystectomy Emergency – Appendectomy	Elective – surgery for colorectal and gastric malignancies, umbilical hernia Emergency – surgery for intestinal obstruction	Elective – Open cholecystectomy Emergency – surgery for duodenal ulcer perforation,ac appendicitis
Risk factors for SSI	Increased duration of surgery and hospital stay, inadequate post-operative surveillance	Increased duration of surgery and hospital stay, co-morbidities	Smoking, anaemia, increased hospital stay, co morbidities

**Discussion:** The present study was undertaken on 450 patients who developed SSI following either elective or emergency laparotomies in patients, admitted to the surgical unit from may 2013 to august 2014,osmania general hospital.

**Incidence:** The overall incidence of SSI for all surgeries performed in the I surgical unit during the study period was 22.2 %. Different studies from various parts of India have shown rates ranging from 6.09 to 38.7 %, with the majority of studies having a rate of 14 – 17 %. The most common age group developing SSI was > 60 years, for both males and females. 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 as age advances.

The incidence for SSI was 16.6 % for elective laparotomies and 28.57 % for emergency abdominal surgeries, which shows that emergency laparotomies were statistically far more likely to develop SSI than elective procedures (p value < 0.0001). This is in conformity with another study conducted at an Indian teaching hospital by Mahesh C B *et al* (p value < 0.002).

**Risk factors:** Among the patient-related risk factors observed in this study, incidence of SSI among smokers<sup>6-10</sup> is 35% and among non smokers is 12 % with statistically significance difference. The most common co-morbidity was Diabetes Mellitus, the rate of SSI among diabetics is 46.6% and among non diabetics is 10% which is statistical significance difference. The other risk factors which were included were Obesity, Hb < 10 gm%, COPD all of which showed statistical significance SSI rates. The two immunocompromised states included in the studies was cancer and hiv/aids which both showed statistical significant higher rates of SSI.

**Bacteriology:** The most common organism implicated in this study was *MRSA*. The Gram-negative organisms implicated were found to be most sensitive to the aminoglycosides Amikacin or Gentamicin, followed by third generation cephalosporins and penicillins and to tetracycline and doxycycline. Resistance of enteric organisms to Ciprofloxacin is in conformity with reports of increasing resistance to this drug as reported by Chand Wattal *et al* in a study conducted in a tertiary hospital at New Delhi.

**Conclusions:** The incidence of SSIs following laparotomies is 22.2%. Emergency laparotomies were statistically more likely to develop SSI than elective laparotomies. A large share of abdominal SSIs was occupied by surgeries with clean-contaminated wounds, which is similar to other studies. It reflects the higher proportion of such cases in laparotomies.

Diabetes mellitus was the most common co-morbidity encountered. Increase in age, smoking, diabetes mellitus, obesity, hb < 10 gm %, COPD, cancer, hiv/aids, ASA grade, Duration of surgery > 2hrs, wound irrigation with saline, pre op stay > 5 days were the risk factors identified. The most common organism implicated in the development of abdominal SSI was **MRSA**.

Signs of systemic inflammation may be masked by the prolonged use of antibiotics. Most were superficial incisional infections, which, as they were recognized early and managed appropriately, did not progress to deeper and more serious infections. Increased awareness among hospital staff with regard to infection control and strict adherence to the aseptic precautions is the need of the hour.

The incidence of SSI in our hospital is slightly higher when compared to other studies done in developing countries. The high rate of SSI with relative preponderance of MRSA strain calls for intensive infection control practices and routine surveillance of SSI in all hospital.

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