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An Observational Study of Incidence of Surgical Site Infections in Gastrointestinal Surgeries

Dr.Faizan Saiyed[1], Dr.Darshit Kalaria[2]
3RD Year Resident, Department of Surgery, Surat Municipal Institute of Medical Education and Research, Surat
2ND Year Resident, Department of Surgery, Surat Municipal Institute of Medical Education and Research, Surat
Corresponding Author: Dr.Vipul Trivedi
Assistant Professor, Department of Surgery, Surat Municipal Institute of Medical Education and Research, Surat

Abstract:
Objectives: *This study analyzed the incidence of surgical site infections in gastrointestinal surgeries* **.**
Method: *The present study was conducted at General Surgery Department SMIMER, Surat. A observational study of 400 cases that have undergone abdominal surgery in SMIMER hospital and were followed up from the day of operation to 30 days after discharge.*
Results: *Incidence of abdominal SSI: The overall infection rate for a total of the 400 cases was 17.25%. The incidence rate in this study is well within the infection rates of 2.8% to 17% seen in other studies. Different studies from India at different places have shown the SSI rate to vary from 6.09% to 38.7% .* ***Conclusion:*** *Our study reveals that though SSIs have been widely studied since a long time, they still remain as one of the most important causes of morbidity and mortality in surgically treated patients.*
Keywords
SSI: Surgical Site Infection

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I. Introduction

CRITERIA FOR DEFINING A SURGICAL SITE INFECTION (SSI)

Superficial Incisional SSI:

Infection occurs within 30 days after the operation and infection involves only **skin or subcutaneous tissue of the incision and at of the following:**

1. Purulent drainage, with or without laboratory confirmation, from the superficial incision.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial incision.
3. At least one of the following signs or symptoms of infection: pain or tenderness, localized swelling, redness,
4. Diagnosis of superficial incisional SSI by the surgeon or attending physician.

Do not report the following conditions as SSI:

1. Stitch abscess (minimal inflammation and discharge confined to the points of suture penetration).
2. Infection of an episiotomy or newborn circumcision site.
3. Infected burn wound.
4. Incisional SSI that extends into the facial and muscle layers (see deep incisional SSI).

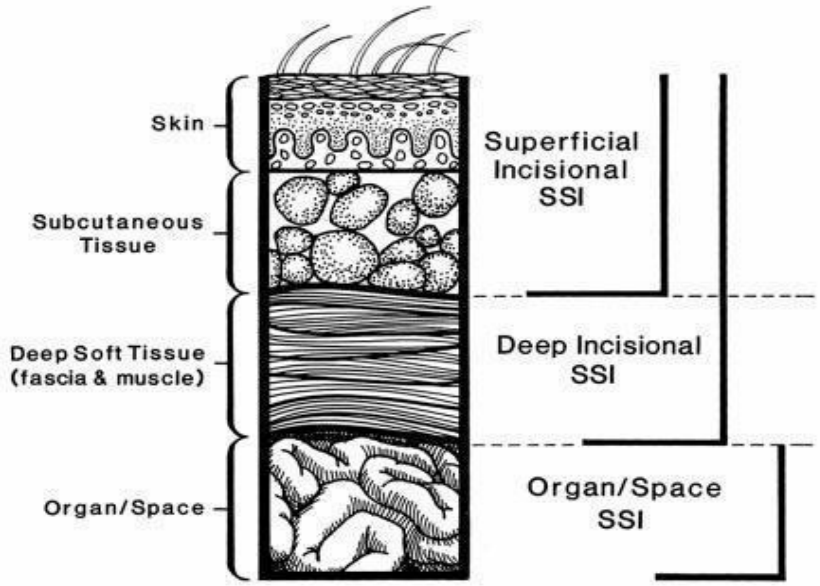
Deep Incisional SSI:

Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation and infection involves deep soft tissues (e.g., facial and muscle layers) of the incision and at least one of the following:

1. Purulent drainage from the deep incision but not from the organ/space component of the surgical site.
2. A deep incision spontaneously dehisces or is deliberately opened by a surgeon when the patient has at least one of the following signs or symptoms: fever (>38ºC), localized pain, or tenderness, unless site is culture-negative.
3. An abscess or other evidence of infection involving the deep incision is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of a deep incisional SSI by a surgeon or attending physician.

Organ/Space SSI: Infection occurs within 30 days after the operation if no implant is left in place or within 1 year if implant is in place and the infection appears to be related to the operation and infection involves any part of the anatomy (e.g., organs or spaces), other than the incision, which was opened or manipulated during an operation and at least one of the following:

1. Purulent drainage from a drain that is placed through a stab wound into the organ/space.
2. Organisms isolated from an aseptically obtained culture of fluid or tissue in the organ/space.
3. An abscess or other evidence of infection involving the organ/space that is found on direct examination, during reoperation, or by histopathologic or radiologic examination.
4. Diagnosis of an organ/space SSI by a surgeon or attending physician.



II. Surgical Wound Classification:

Class 1: Clean:
An uninfected operative wound in which no inflammation is encountered and the respiratory, alimentary, genital, or uninfected urinary tract is not entered. In addition, clean wounds are primarily closed and, if necessary, drained with closed drainage. *Operative incisional wounds that follow nonpenetrating (blunt) trauma* should be included in this category if they meet the criteria.

Class 2/Clean-Contaminated:
An operative wound in which the respiratory, alimentary, genital, or urinary tracts are entered *under controlled conditions* and without unusual contamination. Specifically, operations involving the biliary tract, appendix, vagina, and oropharynx are included in this category, provided no evidence of infection or major break in technique is encountered.

Class 3/Contaminated:
Open fresh and accidental wounds. In addition, operations with *major breaks in sterile technique* (e.g., open cardiac massage) or gross spillage from the gastrointestinal tract, and incisions in which acute, nonpurulent inflammation is encountered are included in this category.

Class 4/Dirty-Infected:
Old traumatic wounds with retained devitalized tissue and those that involve existing clinical infection or perforated viscera. This definition suggests that the organisms causing postoperative infection were present in the operative field before the operation.

RESEARCH QUESTIONS:
- What are the factors associated with SSI in GI surgeries?
- What is the prevalence of SSI in GI surgeries?

AIMS AND OBJECTIVES:
- To access the prevalence of SSI in Gastrointestinal surgeries
- Observation of factors associated with SSI in GI surgeries

III. Methodology

SOURCE OF DATA:
- The material for the present study was obtained from patient‘s undergone Gastrointestinal surgeries in Department of Surat Municipal Institute of Medical Education and Research, Surat from 1st October 2017 to 20th September 2018.
- Surgical site were considered to be infected according to the definition by NNIS.
- As this procedure is not well documented, who volunteered after thorough explanation about the merits and de merits of the procedure, 400 Patients were included in the Study Who Fulfill the Inclusion Criteria.

INCLUSION CRITERIA:
- Age: < 60 years.
- Sex: Male and female.
- Patient undergoing exploratory laparotomy for peptic ulcer perforation (PUP), simple and complicated acute appendicitis (appendicular perforation), small bowel obstruction (SBO) , traumatic and non-traumatic perforation of small and large bowel GI malignancy, penetrating abdominal injuries and other Gastrointestinal surgeries.

EXCLUSION CRITERIA:
- Patient lost to follow up.
- Patients not giving consent to be part of the research.
- Incidental intra/post operative findings of additional pathology.
- Patients who were unable to receive sensitive antibiotics**.**
- Patients with predominant symptoms related to gastrointestinal pathology not undergoing surgery.

TECHNIQUE:
- An elaborate study of these cases with regard to date of admission, history, clinical features of wound infection, type of surgery, emergency or elective, preoperative preparation and postoperative management is done till patient is discharged from hospital, and then followed up the patient on OPD basis for any signs of wound infection.
- In history, presenting complaints, duration, associated diseases, coexistent infections at a remote body site, personal history including diet, smoking, and alcoholism were noted.
- Preoperative findings which include preoperative bath, skin preparation, type and time of preparation, preoperative abdominal skin culture, nasal swab for culture for commensals, preoperative antibiotics use.
- Operative findings which include, type of incision, wound contamination, drain used and its type, and duration of operation.
- Postoperative findings which included, day of wound infection, day of 1st dressing and frequency of change of dressing.
- Findings on the day of diagnosis of wound infection were noted which included fever, erythema, discharge, type and colour and the exudates was collected from the depth of the wound using sterile cotton swab and was sent to microbiology department for culture and sensitivity.

PROCEDURE IN LABORATORY:
In the microbiology department, the swabs were inoculated onto blood agar plate, McConkey‘s agar plates and nutrient broth. Inoculated media were incubated aerobically at 37 0 C for 24-48 hrs

Infected Post Operative Wound

Infected Post Operative Wound with Pus Discharge

Wound After Suture Removal

Wound in the healing phase

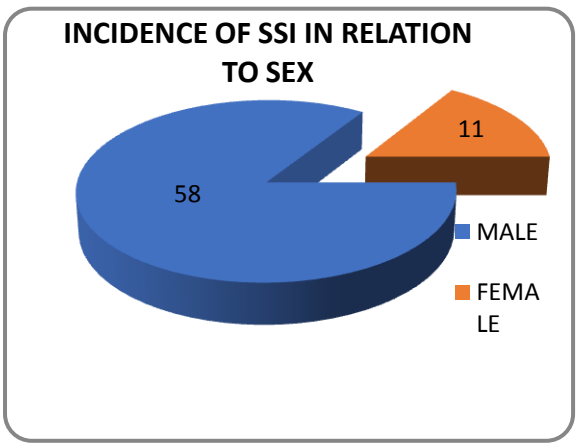
IV. Results

TABLE NO. 1: SEX WISE DISTRIBUTION

- In our study among 400 patients, 280 patients were males and 120 patients were females. Among them 58 male patients (20.71 %) and 11 female patients (9.16 %) are found to develop Surgical Site Infections who had undergone gastrointestinal surgeries.

Sex	Total patients	Infected patients	Percentage
Male	280	58	20.71 %
Female	120	11	9.16 %

In my study 70% cases were males and remaining were females.



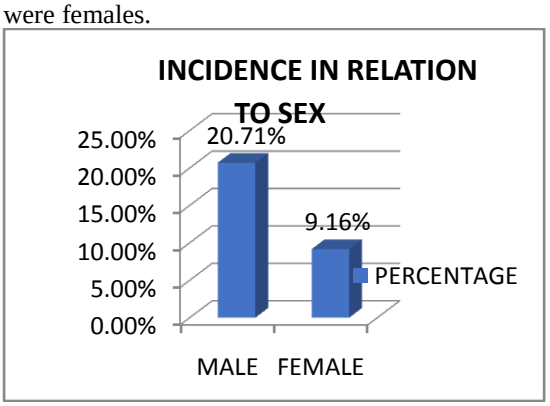
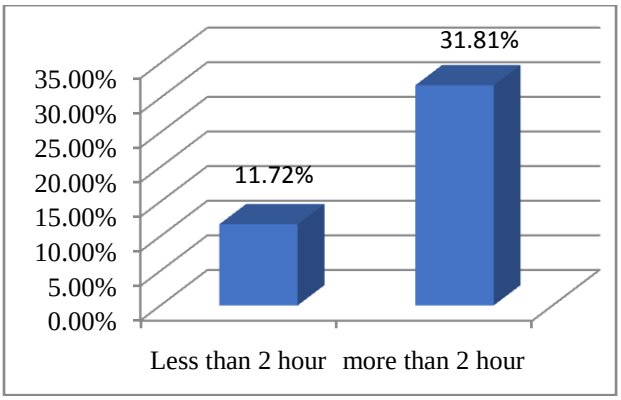


TABLE NO.3: DURATION OF SURGERY

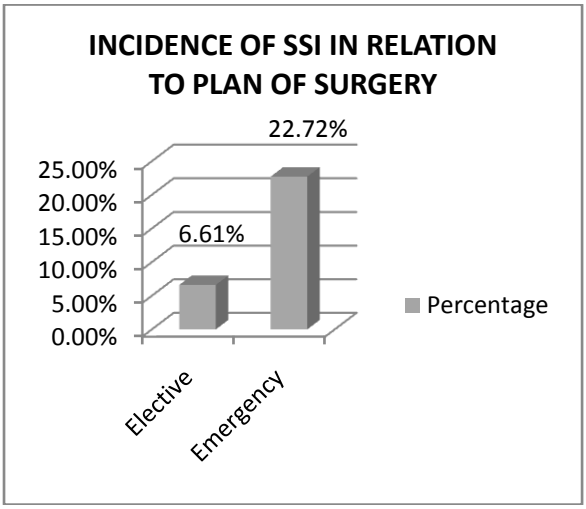
- In our study 400 patients who underwent GI surgeries among them 69 patients found to develop SSI. Incidence of SSI is high 32.81 % (35 out of 110 cases) in patients where total duration of surgery was more than two hours. However incidence of SSI appears to be relatively low (11.72 %) (34 out of 290 cases) in patients where surgery was lasted



Duration of surgery	Total No of cases	Infected cases	Percentage
Less than 2 hours	290	34	11.72 %
More than 2 hours	110	35	31. 81 %

TABLE NO.4: PLAN OF SURGERY

- In our study among 400 patients, 136 patients were undergone elective surgery and 264 patients were undergone emergency surgeries. Among them 60 patients (22.72 %) who had undergone emergency surgeries and 09 patients (6.61%) who had undergone elective surgeries are found to develop Surgical Site Infections who had undergone gastrointestinal surgeries.



Plan of surgery	Total No of cases	Infected cases	Percentage
Elective	136	09	6.61 %
Emergency	264	60	22.72 %

TABLE NO.5: CAUSATIVE ORGANISM

- In our study among 400 patients, 69 patients were found to develop Surgical Site infection, among them we further divided the causative organism causing SSI.

Name of the organism	No of cases	Percentage
Pseudomonas	33	47.82 %
Klebsiella	14	23.33%
E. coli	12	17.39 %
Streptococcus	05	7.24%
Acinatobacter	02	2.89%
Helicobacter	01	1.44%
Providentia	02	2.89 %

In our study among 400 patients, 69 patients were found to develop Surgical Site Infection, among them we further divided the causative organism causing SSI.

In our observation Pseudomonas appears to be the most common (33 out of 69 cases) (47.82%) causative organism followed by Klebsiella (14 cases out of 69) (23. 33%), E coli (12 out of 69 cases) , Streptococcus (5 out of 69) (17.39%), Acinetobater (2 cases out of 69) (2.89%), Helicobacter (1 case out of 69) (1.44 %) , providentia (2 cases out of 69) (2.89%)

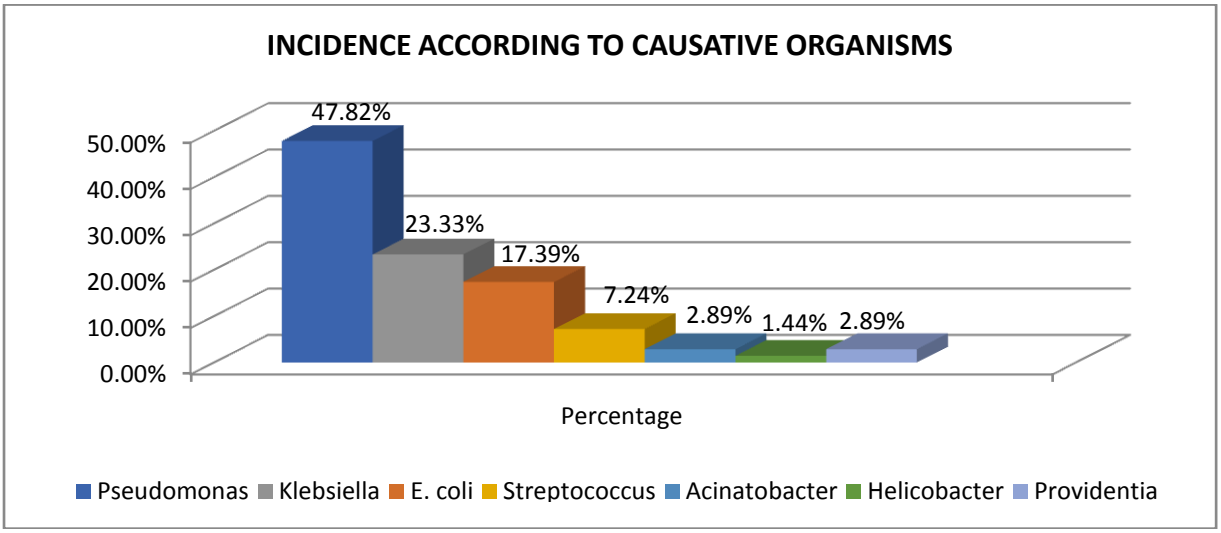


TABLE NO.6: **RISK FACTORS**

In our study among 400 patients, 69 patients were found to develop Surgical Site Infections, among them the incidence of SSI increases as the patient's with various risk factors, who had undergone gastrointestinal surgeries.

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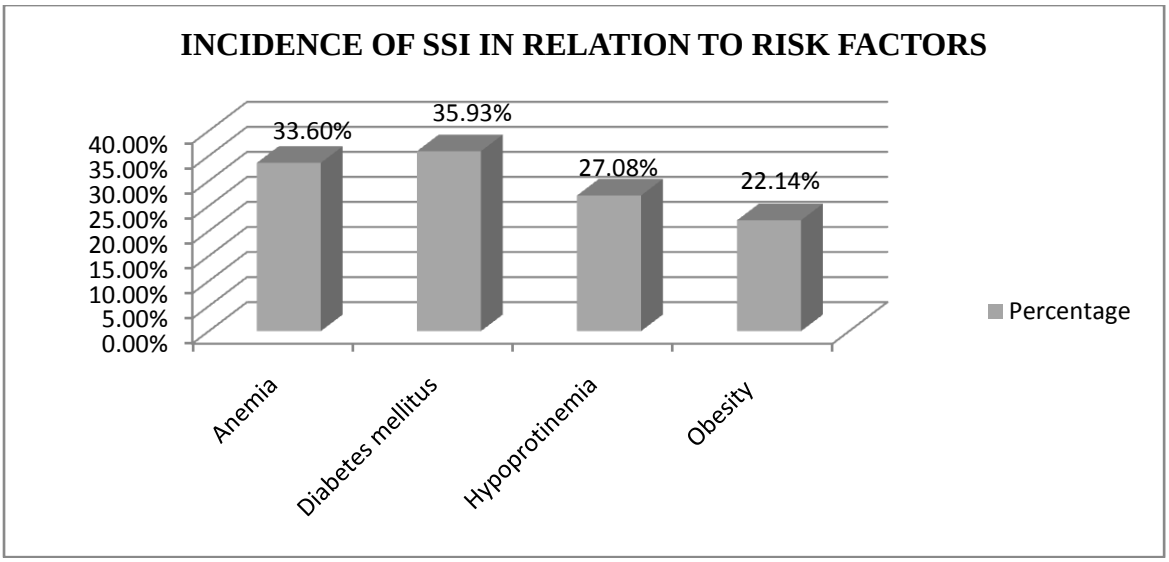
Risk factor	Total cases	Infected cases	Percentage
Anemia	125	43	33.6 %
Diabetes mellitus	64	23	35.93 %
Hypoprotinemia	48	13	27.08 %
Obesity	140	31	22.14 %

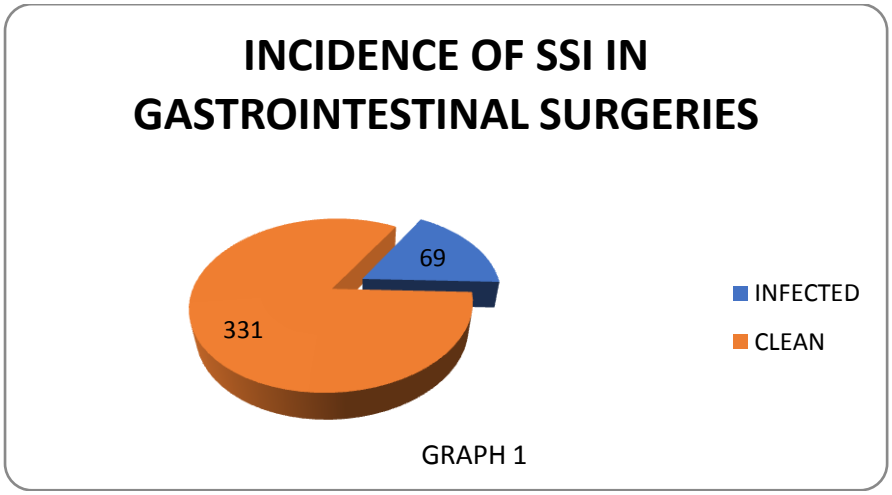


- In our study among 69 infected patients, incidence of SSI appers to be increased in with risk actors as follows: Incidence is 33.6 % (43 out of 125) in patients with anemia, Incidence is 35.93 % (23 out of 64) in patients with Diabetes, Incidence is 27.08 % (13 out of 48) in patients with Hypoprotinemia and Incidence is 22.14 % (31 out of 140) in patients with anemia.

RESULTS

1. In our study among 400 patients, 69 patients were found to develop Surgical Site Infections who had undergone gastrointestinal surgeries.

TOTAL NO OF CASES	INFECTED CASES	PERCENTAGE
400	69	17.25 %



GRAPH 1

This study included 400 GI surgical patients, out of which 69 were infected.
So the gross incidence is 17.25 %.

V. Discussion

The present study was conducted at General Surgery Department SMIMER Surat. This is a observational study of 400 cases that have undergone abdominal surgery in SMIMER hospital and were followed up from the day of operation to 30 days after discharge.

Incidence of abdominal SSI The overall infection rate for a total of the 400 cases was 17.25%.
The incidence rate in this study is well within the infection rates of 2.8% to 17% seen in other studies. Different studies from India at different places have shown the SSI rate to vary from 6.09% to 38.7% [121].

The infection rate in Indian hospitals is much higher than that in other countries; for instance in the USA, it is 2.8% and it is 2-5% in European countries. The higher infection rate in Indian hospitals may be due to the poor set up of our hospitals and also due to the lack of attention towards the basic infection control measures.

VI. Conclusion

- Incidence of abdominal surgical site infections 17.25%.
- Emergency cases has high infection rate.
- Risk factors like anemia, diabetes mellitus, hypoproteinemia, & obesity are associated with increased wound infection rate.
- Longer the duration of surgery more is the wound infection rate.
- Pseudomonas being the most common organism isolated in the study.

The following methods are recommended for further reducing infection.

- Regular surveillance and feedback of results to surgeons, presumably influencing surgical technique.
- Reducing the pre-operative stay to minimum.
- Minimizing the length of operation.
- Avoiding wound drains. If this is not possible, using a closed drainage system and removal of drains as soon as possible.
- Ensuring that the patient is as fit as possible.
- Using a good surgical technique.

- Encouraging efforts in reducing the known risk factors to a bare minimum in elderly patients.
- Proper collection and transport of samples from the surgical site, immediately on suspicion of infection.
- Awaiting antibiotic sensitivity test results for appropriate antibiotic therapy, to avoid emergence of resistant strains.

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