Original Research Paper

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General Surgery

STUDY ON SURGICAL SITE INFECTIONS IN ELECTIVE ABDOMINAL SURGERIES

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ABSTRACT

BACKGROUND

Surgical site infections (SSIs) represent a significant burden worldwide. Post operatively surgical site infections (SSIs) still remain a significant problem. This study is about SSIs that occur in elective abdominal surgeries in MGM Govt. Hospital, Tiruchirapalli.

OBJECTIVES

To study the incidence of SSIs in patients undergoing elective abdominal surgeries. To study about the risk factors associated with SSIs and to find out common organisms causing SSIs.

MATERIALS AND METHODS

A prospective study was carried out in 100 patients who underwent elective abdominal surgeries in MGM Govt.hospital ,Tiruchirapalli during the period October 2015 to September 2016. Samples from infected wound are collected under aseptic precautions and sent for microbiological analysis.

RESULTS AND CONCLUSION

The overall incidence of SSI was found to be 16%. The incidence increases with increasing age. It also shows significant increase in incidence in patients with increased pre operative hospitalization. Obesity and systemic illnesses increases the rate of SSIs. If the duration of surgery is prolonged then it would be associated with increased incidence of SSIs. The use of drain increases the rate of wound infection.

KEYWORDS : SSI, wound infection, antiobiotics, staphylococcus aureus

INTRODUCTION

Surgical site infections (SSIs) are associated with any surgical procedure and represent a significant burden in terms of patient morbidity, inconvenience to surgeon and extended hospital stay. SSIs have been shown to compose upto 20% of all healthcare associated infections and constitute significant burden to healthcare services. Atleast 5% of patients undergoing surgical procedures develop SSIs. SSIs may range from spontaneous limited wound discharge to life threatening complications. Most SSIs are caused by contamination of an incision with microorganisms from patient's own body during surgery than from outside. Majority of SSIs are preventable. The study of organisms causing SSIs are used for selecting antibiotic prophylaxis.

Surgical site infections can be divided into major and minor surgical site infections. A major SSI is defined as a wound with significant quantity of pus draining spontaneously or it needs a secondary procedure to drain it. The patient may have systemic signs like pyrexia tachycardia and raised white blood cell count.

AIM

To study the incidence, risk factors and causative organisms of surgical site infections in patients undergoing elective abdominal surgeries in the Department of General Surgery from October 2015 to September 2016 in MGM Govt. Hospital, Tiruchirappalli.

DEFINITION

SSIs range from simple wound discharge to life threatening complications secondary to sepsis. SSIs are most common nosocomial infection in surgical patients. In elective abdominal surgeries the rate of postoperative wound infections range from 2% to 26% which is even higher in emergency surgeries. dominal surgeries. This preventive measure starts with identification of patients with high risk for SSIs.

RISK FACTORS FOR DEVELOPMENT OF SSIs

MICROORGANISM	LOCAL WOUND	PATIENT
Remote site infection	Haematoma	Age
Recent hospitalization	Seroma	Immunosuppression
Duration of surgery	Necrosis	Steroids
Wound class	Sutures	Malignancy
Previous antibiotic therapy	Drains	Obesity
Pre operative shaving	Foreign bodies	Diabetes
Bacterial number		Obesity
Virulence of organism		Transfusions
		Smoking
		Oxygen
		Temperature

ASSESSMENT OF RISK:

NNIS risk index elements are as follows [iii]:

1. **Pre operative physical status** of the patient assessed by anaesthesiologists and classified.
2. **Status of wound** either contaminated / dirty or clean.
3. **Duration of surgery**

Predictive percentage of SSI occurrence by wound type and risk index [iv]:

AT RISK INDEX	PREDICTIVE % OF SSI
0	1.5
1	2.9
2	6.8
3	13.0

Wound Classification and Subsequent possibility for risk of wound infection (without use of antibiotics)[v]:

Classification	Description	Infective risk %
Class 1 - Clean	Uninfected operative wound, no acute inflammation, closed primarily. Respiratory, gastrointestinal, biliary, urinary tract not entered. No break in aseptic technique, closed drainage used if necessary.	< 2
Class2-Clean-contaminated	Elective entry into respiratory, biliary, gastrointestinal, urinary tract and with minimal spillage. No evidence of infection or major break in aseptic technique. Ex : appendicectomy	<10
Class 3-Contaminated	Presence of non purulent inflammation. Spillage of GI contents. Penetrating wound < 4hours. Lack of aseptic technique.	About 20
Class 4-Dirty / infected	Pus discharge from wound. Presence of visceral	About 40

	perforation during preoperative period. Penetrating injuries lasting longer than 4 hours.	

INVESTIGATIONS

LAB STUDIES
Collect swab for culture. Two swabs are necessary one for smear preparation and the other for culture. Both aerobic and anaerobic organisms are cultured routinely.

IMAGING STUDIES
Ultrasonogram is used in cases of wound infection to assess any underlying collection.

Antibiotic prophylaxis
It is the current recommendation to administer antibiotic through intravenous route ½ hour before making skin incision. If antibiotics is administered 2 hours prior to surgery is usually ineffective.

Preventive measures for surgical site infections:

Timing	Micro Organism	Local	Patient
Pre operative	1.Shorten pre op stay 2. Antiseptic shower pre operatively, 3. Appropriate or no hair removal. 4. Avoid or treating remote infections. 5.Antibiotic prophylaxis	Appropriate pre op hair removal or no hair removal	Optimize nutrition, Preoperative warming, Tight glucose control, Stop smoking
Intra operative	1. Asepsis and antisepsis. 2. Avoid of spillage of GI contents	Haematoma/seroma Good perfusion, Complete debridement, Dead spaces, Monofilament sutures, Justified use of drains	Supplemental oxygen, Intra operative warming, Adequate fluid resuscitation, Tight glucose control
Post operative	Protect wound site for 48-72 hrs, Remove drains as soon as possible, Avoid post operative bacteremia	Post operative dressing for 48-72 hrs	Early enteral feeding, Supplemental oxygen, Tight glucose control, Surveillance programs

Following steps have positive impact on outcome:

1) Careful handling of tissues.
2) Meticulous dissection, hemostasis and debridement of devitalized tissues.
3) Control of intraluminal contents from spilling into abdominal cavity.
4) Preservation of blood supply of the operated organs.
5) Elimination of foreign body.
6) Maintaining strict asepsis by the operating team.
7) Thorough drainage and irrigation of pus from the wound using warm saline.
8) Maintaining the patient in euthermic state.
9) Proper decision regarding closing the wound either primarily or secondarily.

The overall surgical site infection rate increases progressively from clean(2.9%), to clean-contaminated(3.9%), to contaminated (8.5%), to dirty- infected (12.6%).

METHODOLOGY
A Prospective study of 100 patients admitted in MGM Govt. Hospital from October 2015 to September 2016 in the Department of General Surgery who underwent elective abdominal surgeries.

Inclusion criteria
- Adult male and female patients
- Patients undergoing elective abdominal surgical procedure
- Patients with co-morbid conditions like diabetes, hypertension.

Exclusion criteria
- Immunocompromised individuals
- Children

Data collection
Pre-operative factors Age and sex, POH, Diagnosis, BMI, Co-morbid conditions noted. Operative factors are evaluated based on the type of anaesthesia used, wound class, type of surgery, use of drain or mesh, sign of SSI, day of presentation and cultured organisms.

RESULTS
This study includes 100 elective abdominal surgical patients out of which 16 patients were found to have SSIs.

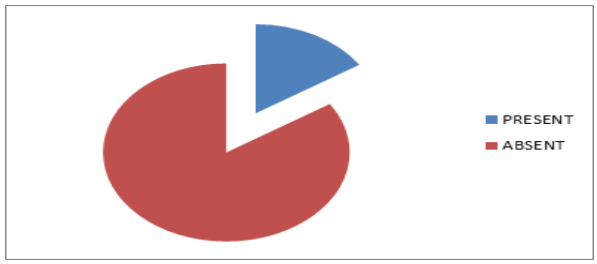

Table 1: INCIDENCE OF SSI

INCIDENCE IN RELATION TO SEX:

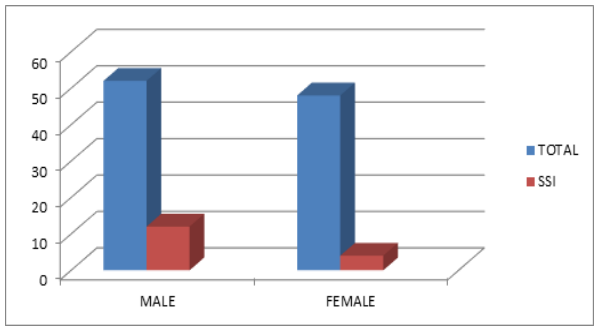

TABLE 2 : INCIDENCE IN RELATION TO SEX

This study reveals male preponderance for post operative wound infections which are statistically significant

INCIDENCE IN RELATION TO AGE GROUP:

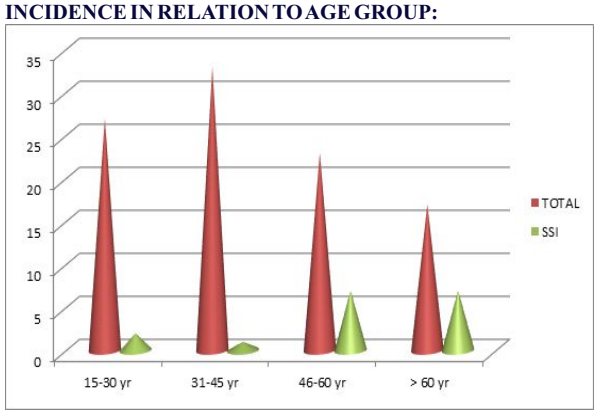

Table 3: INCIDENCE IN RELATION TO AGE

On analyzing it was found that the incidence is more in the age group of above 60 year followed by more in the age group of 45-60 years.

INCIDENCE IN RELATION TO WOUND CLASS:

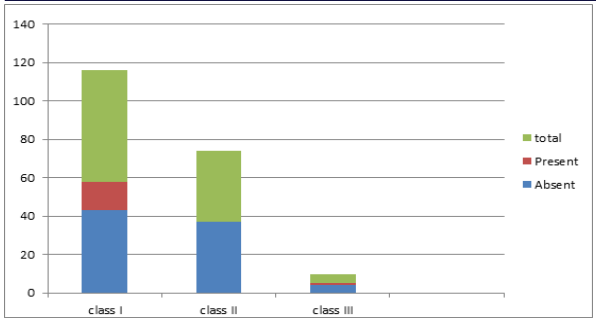

Table 4: INCIDENCE IN RELATION TO WOUND CLASS

In this study we had 58 patients in class I,37 in class II and 5 in classIII. Class IV patients are coming under in this study.

INCIDENCE IN RELATION TO TYPE OF ANAESTHESIA:

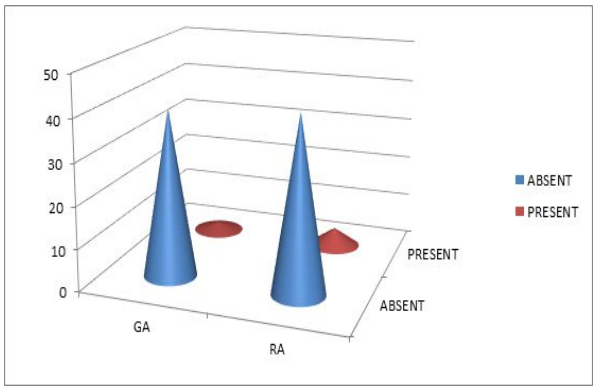

Table 5: INCIDENCE IN RELATION TO TYPE OF ANAESTESIA

It was found that about 27.58% of patients given regional anaesthesia developed SSIs when compared with patients given GA 4.76% developed SSIs.

INCIDENCE OF SSI IN RELATION TO BMI:

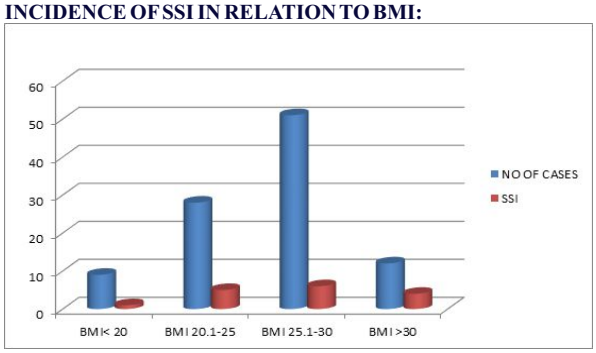

Table 6: INCIDENCE IN RELATION TO BMI

According to the data obtained in this study most people belong to the category with BMI of 25-30 followed by BMI of 20-25. SSI is more common among people having BMI more than 30.

INCIDENCE IN RELATION TO REMOTE OR SYSTEMIC INFECTIONS:

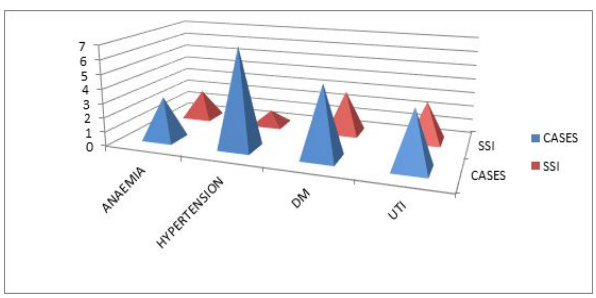

Table 7: INCIDENCE IN RELATION TO REMOTE OR SYSTEMIC INFECTION

In this study incidence of SSI is highest in anaemic patients about 66.6% followed by diabetes mellitus in which the incidence is 60%.

INCIDENCE IN RELATION TO PREOP HOSPITALISATION:

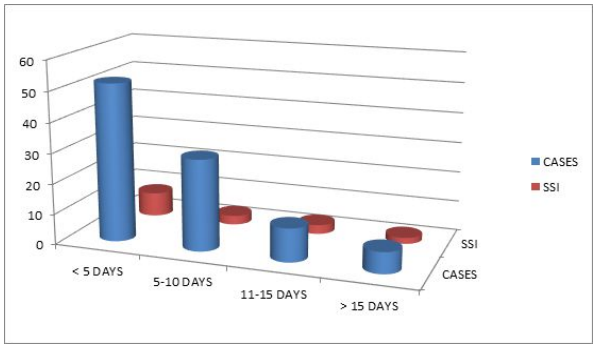

TABLE 8: INCIDENCE IN RELATION TO PRE OP HOSPITAL STAY

Incidence of SSI is high if pre operative hospital stay is prolonged.

INCIDENCE IN RELATION TO DIAGNOSIS:

DIAGNOSIS	NO OF CASES	INCIDENCE	PERCENTAGE
INGUINAL HERNIA	24	8	33.33%
INCISIONAL HERNIA	20	5	25%
CHOLECYSTITIS	12	NIL	
APPENDICITIS	15	NIL	
CARCINOMA STOMACH	3	1	33.33%
PERIAMPULLARY CARCINOMA	4	1	25%
UMBILICAL HERNIA	8	2	25%

Table 9: INCIDENCE IN RELATION TO DIAGNOSIS

In this study incidence of SSI is highest in inguinal hernia and carcinoma stomach patients.

INCIDENCE IN RELATION TO DURATION OF SURGERY:

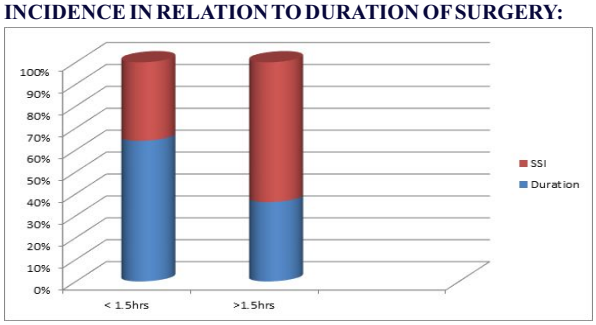

Table 10: INCIDENCE IN RELATION TO DURATION OF SURGERY

Incidence of SSI is high if the duration of surgery is more than 1.5 hrs.

INCIDENCE IN RELATION TO USE OF DRAIN AND MESH:

	NO OF CASES	INFECTION	PERCENTAGE
NO DRAIN/MESH	29	NIL	
DRAIN	8	2	25%
MESH	34	10	29.41%
BOTH	29	4	13.79%

Table 11: INCIDENCE IN RELATION TO USE OF DRAIN OR

MESH

Incidence of wound infection is high in cases where mesh is used followed by cases where drain is used.

INCIDENCE OF INFECTION NOTED ON POSTOPERATIVE DAY:

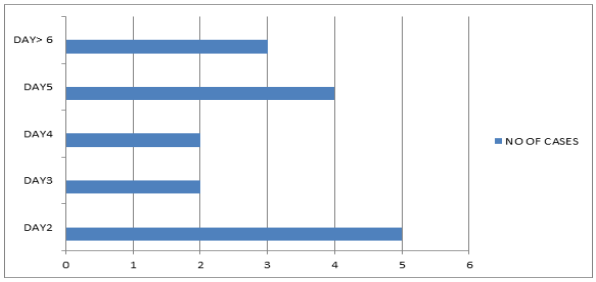

Table 12: INFECTION NOTED ON POST OPERATIVE DAY

Incidence of SSI is more notifiable on second post operative day.

INCIDENCE IN RELATION TO MICROORGANISMS ISOLATED :

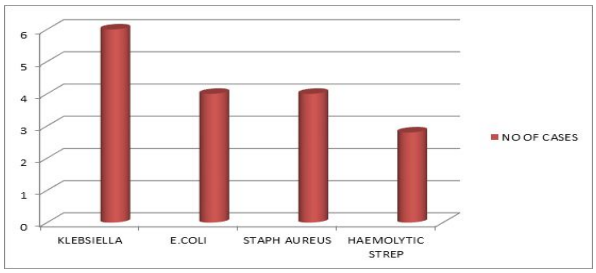

Table 13: INCIDENCE IN RELATION TO MICROORGANISMS ISOLATED

Klebsiella is commonly isolated from wound culture followed by E.Coli and Staphylococcus aureus.

DISCUSSION

In developing countries, no proper study, surveillance or feedback available regarding the incidence of SSIs. Most of the studies are conducted in isolation and the rate of SSIs vary from institution to institution, which warrants a united approach to develop and adopt certain strategies to overcome this ever menacing problem.

In this study out of 100 patients ,SSI occur in 16 patients. This incidence is found to be higher than that in western countries such as United Kingdom (3.1%) , Holland (4.3%), etc.

Age related incidence of SSI in this study shows higher in the 45-60 age group, even more among those aged more than 60 yrs. But the overall incidence of SSI does not differ significantly in each age group. Hence according to this study age of the patient does not affect the incidence of SSIs significantly.

The incidence of SSI in our study is 16% which favourably compares with studies of Raka et al (12%) and Razavi et al (17.4).

Incidence in relation to other studies:

	Present study	Raka et al	Razavi et al
No of cases	100	225	802
No of cases infected	16	27	139
Incidence	16%	12%	17.4%

In sex wise incidence, there is higher incidence in males without any reason to explain this. In sample the presence of higher number of males can be considered as a reason.

The rate of SSI incidence differed by wound classification in our study. The maximum number of incidence of SSI noted in class I followed by class III wounds. We had no class IV wound included in this study as this study involves only elective abdominal surgeries.

There is no significant correlation considered between occurrence of SSI and the type of anaesthesia given.

According to this study, obese individuals with BMI > 30 have increased incidence compared to those with less BMI. Similar results were obtained in Hoer Jet al study. This is mainly due to the decrease in blood circulation in fat tissues.

Incidence of SSI in those with associated risk factors like anaemia, diabetes mellitus and with remote infections are more compared to those without risk factors.

According to this study, the incidence of wound infections are significantly higher in those with pre operative hospitalistion of more than 10days. This is attributed to the possibility of colonization of patients with nosocomial strains during the hospital stay. There is possibility of having reduced nutritional food intake which is a additive factor for development of SSIs.

Usage of pre operative antibiotic prophylaxis reduces the rate of SSIs from 20% to 15.2%. It reduces the microbial burden of the intra operative contamination to a level that can be handled by host defence mechanisms.

However there is significant correlation observed from this study between duration of surgery and the incidence of SSIs. The risk of SSI increases when the duration of surgery is more than 90 minutes. This is attributable to the explanation that prolonged exposure of tissues and prolonged tissue handling make the tissues more vulnerable to the incidence of wound infection.

The presentation of SSI at the earliest time according to this study is on 2nd post operative day which may even present as pain.

In this study the bacteriological profile showed that the commonest organisms isolated from the culture are klebsiella followed by E.Coli and staphylococcus aureus. It also showed that commonly there is single organism involved in causing SSIs.

CONCLUSION

A total number of 100 patients are enrolled in this study and out of which about 16 patients developed SSI. The occurrence of wound infection is maximum in class I wound in the age group of more than 45 yrs. There is no statistical correlation in the incidence of SSI with the type of anaesthesia given. The duration of surgery found to have a significant role in causing wound infections especially if it is more than 90 minutes duration. The use of mesh and drain acts both as a single factor or additive to the presence of drain in causing wound infections.

The older principles of antiseptic care and hygiene still gains importance even today in causing SSIs. Non drug based preventive measures of SSI should be considered by every treating surgeon so as to prevent SSIs and its consequences.

CONCLUSION

1. Incidence of SSIs in elective abdominal surgeries in our hospital is found to be 16%.
2. Age group of 45 year and above are found to be more susceptible in developing wound infections.
3. Out of 100 patients patients with BMI > 30 have increased incidence of SSIs.
4. If the pre operative hospitalization is more than 15 days there is increased occurrence of SSIs.
5. This study does not reveal any statistically significant correlation between sex and the type of anaesthesia used.
6. If the duration of surgery is more than 90 minutes the incidence of wound infections were found to be higher.
7. Use of drain increases the incidence of wound infections.
8. There will be considerable potential for the reduction of morbidity and cost of hospitalization by introducing well implemented prevention policies.

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