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A PROSPECTIVE STUDY ON OCCURENCE AND RISK FACTORS OF ABDOMINAL SURGICAL SITE INFECTION

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ABSTRACT

INTRODUCTION

Surgical site infection (SSI) is defined 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. It is one of the most common health care- associated infections,occurring following 1%-3% of all surgical procedures.

AIMS AND OBJECTIVES

The most common complications of in-patient admissions are Abdominal surgical site complications.They contribute to severe consequences for outcome and costs. Different risk factors may be involved including age, sex, nutrition and immunity, prophylactic antibiotics, operation type and duration , type of shaving, and secondary infections.

The aim of the study is to determine the abdominal surgical site infections in surgical ward.

Risk factors associated with the abdominal surgical site infections.

The most common causative organisms encountered and its sensitivity and resistence pattern in post operative wound infection.

PATIENTS AND METHODS

The study was conducted in Department of General Surgery, Mamata General Hospital, Khammam from October 2018 to September 2020. A total of 50 cases of abdominal surgeries which meet the inclusion criteria were included in the study.

RESULTS

Among 50 cases of abdominal surgeries underwent, 11 cases were infected. The incidence rate of abdominal surgical site infection is 22%. Among 50 cases of abdominal surgeries underwent, 30 cases had Elective surgeries and 20 cases had Emergency surgeries. Among 11 abdominal surgical site infections, the organisms isolated were Pseudomonas, Staphylococci, Klebsiella, was 2 (28 .75%) each respectively, and E.Coli was 1 (14.28%)

CONCLUSION

In present study we concluded that Incidence of abdominal surgical site infection was 22%.

Most common infected patients belong to old age group. High infection rate was seen in Emergency cases.

KEYWORDS : ABDOMINAL SURGICAL SITE INFECTION, INCIDENCE,

ABDOMINAL SURGERIES, RISK FACTORS

INTRODUCTION

High incidence of nosocomial infection are seen in department of surgery. Even though advanced infection control practices like improved operating room ventilation, sterilization methods, barriers, surgical techniques, and availability of antimicrobial prophylaxis are maintained, SSI remains the main cause of morbidity, prolonged hospitalization, and increase death. It has been reported that SSI rates range from less than1% to more than 10% and 75% of SSI associated deaths are directly attributable to SSI [1,2] . SSI causes severe threat to patient's health and life and also impose economic burden to patient's family and society. In the cae of a surgical patient early diagnosis and treatment are essential. Thus it is essential to identify the factors responsible for SSI and prevent occurrence of nosocomial infections , alleviative patient'spain, by taking corresponding measures

Thus, it is urgent that we identify the factors responsible for SSI and, if possible, corresponding measures should be taken to prevent the occurrence of nosocomial infection, alleviate patients' pain, speed their recovery, and reduce their medical expenses[3] .

Our skin is filled with landmines, little bacterial bombs just lying in, wait for the right moment to explode into action. As long as we are healthy it is thwarted; a person who is ill, however, may have compromised immune system incapable of raising a defense. A surgical incision is all that bacteria needs for the battle to begin[4]. Surgical infections are result of any surgical procedure. These infections are associated with greater morbidity, mortality, and healthcare cost. SSI can double the length of time a patient stays in hospital and there by increase the costs of health care. The factors which influence SSI are characteristics of the patient, operation, personnel and hospital[5]

PATIENTS AND METHODS

The present study was a single center, Prospective study conducted on patients undergone to abdominal surgeries in the surgical wards of Mamata General Hospital from October 2018 to September 2020. Ethical clearance was obtained from Mamata Medical college, Khammam before initiation of study. Total 78 abdominal surgery patients were reviewed in OPD, among them 50 (64.10%) patients were enrolled into present study who meet the inclusion criteria, 28 (35.89%) patients were excluded.

Inclusion Criteria

1. All patients who have undergone abdominal surgeries in the Department of General surgery, Mamata General Hospital, Khammam.
2. Patients willing to participate in the study

Exclusion criteria

1. Patients with previous abdominal surgery.
2. Wound site previously infected.
3. Stitch abscess cases.
4. Patients unwilling for the study.

Method of collection of Data:

1. All cases admitted to surgical ward for major abdominal surgeries wasevaluated through history, co morbid condition and through clinical examination on the basis of inclusion and exclusion criteria.

2. Routine investigation will be done in all cases along with specific investigations if any, depending upon the history and their requirement.
3. Patients were selected randomly.
4. The following risk factors were studied.

a. Sex
b. Obesity – Body mass index above 30 is taken as obesity in this study.
c. Site and type of incision used for abdominal surgery.

RESULTS

This study included 50 abdominal surgical patients, out of which 11 were infected. So the incid ence is 22%.

Table 1: Patients were distributed according to SSI

SSI	Frequency	Percentage
Yes	11	22%
No	39	78%
Total	50	100%

Table 2: Patients were distributed according to age groupVs SSI

Age group	Without SSI Frequency	With SSI Frequency	Total	P-VALUE
21-30	04 (100%)	00 (00%)	04 (8%)	0.61
31-40	06 (85.17%)	01 (14.28%)	07 (14%)	
41-50	11 (84.61%)	02 (15.38%)	13 (26%)	
51-60	07 (77.77%)	02 (2.22%)	9 (18%)	
61-70	08 (66.66%)	04 (33.33%)	12 (24%)	
71-80	03 (60%)	02 (40%)	05 (10%)	
Total	39	11		

Among 50 patients, 13 patients were of age between 41-51 years.Out of 13 patients between 41-51 years 2 (15.38%) patients were having SSI and 11 patients were without SSI.12 patients were with age between 61-70y, out of them 4 (33.33%)patients were having SSI and 8 patients were without SSI. 9 (18%) patients were between age group 51-60, out of them 2 patients were having SSI and 6 patients were without SSI.

Table 3: Patients were distributed according to Gender Vs SSI

Gender	Without SSI Frequency(%)	With SSI Frequency (%)	Total	P - Value
Male	22 (78.57%)	06 (21.42%)	28 (56%)	0.91
Female	17 (77.27%)	05 (22.72%)	22 (44%)	
Total	39	11		

Among 50 patients, 28 (56%) patients were male patients, out of them 6 (21.42%) patients were having SSI and 22 (78.57%) patients were without SSI. 22 (44%) patients were females, out of them 5 (22.72%) patients were having SSI and 17 (77.27%) patients were without SSI.

Table 4 :Patients were distributed according to BMI Vs SSI

BMI	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
≤ 20 kg/m^2	10 (90.9%)	01 (9.09%)	11 (22%)	0.55
20.1 – 25 kg/m^2	09 (75%)	03 (25%)	12 (24%)	
25.1 – 30kg/m^2	12 (80%)	3 (20%)	30%)	
>30 kg/m^2	8 (66.66%)	4 (33.33%)	12 (24%)	
Total	39	11	50	

The patients having BMI in the range of 25-30 kg/m^2 were 15 (30%) predominant out of this 3 (20%) were with frequency and 12 (80%) were without frequency.

Table 5 : Patients were distributed according to Type of Surgery Vs SSI

Type of Surgery	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
Elective	15 (83.33%)	04 (16.66%)	30 (36%)	0.49
Emergency	24 (75%)	07 (25%)	20 (64%)	
Total	39	11	50	

High incidence of SSI was seen in patients undergone Emergency surgery 7 (25%).

Table 6 : Patients were distributed according to ASA status Vs SSI

ASA Status of Patient	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
I	4 (80%)	1 (20%)	5 (10%)	0.26
II	5 (83.33%)	1 (6.66%)	6 (12%)	
III	22 (88%)	3 (12%)	25 (50%)	
IV	7 (58.33%)	5 (41.66%)	12 (24%)	
V	1 (50%)	1 (50%)	2 (4%)	
Total	39	11	50	

Among 50 patients majority i.e. 25 (50%) patients have ASA status is III, out of them 3(12%) patients were having SSI and 22 (88%) patients without SSI.

Table 7 : Patients were distributed according to Class of wounds Vs SSI

Class of Wounds	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
Clean	20 (83.33%)	4 (16.66%)	24 (48%)	0.13
Clean	7 (77.77%)	2 (22.22%)	9 (18%)	

Contaminated				
Contaminated	8 (72.72%)	3 (27.27%)	11 (22%)	
Dirty	4 (66.66%)	2 (33.33%)	6 (12%)	
Total	39	11	50	

Majority were found with clean wounds i.e.24 (48%) in wich 4 (16.66%) with SSI and 20 (83.33%) without SSI.

Table 8 : Patients were distributed according to Duration of Surgery

Duration of Surgery	Without SSI Frequency	With SSI Frequency (%)	Total	P-Value
< 1 hour	21 (95%)	1 (04.54%)	22 (44%)	0.05
2-3 hours	14 (73.68%)	5 (26.31%)	(38%)	
>3 hours	4 (44.44%)	5 (55.55%)	9 (18%)	
Total	39	11	50	

Table 9 : Patients were distributed according to Co-morbidities Vs SSI

Co morbidities	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
Diabetes with Hypertension	13 (76.47%)	4 (23.52%)	17 (34%)	0.89
Diabetes	09 (75%)	3 (25%)	12 (24%)	
Anemia	2 (66.66%)	1 (33.33%)	3 (6%)	
Hypertension	10 (90.9%)	1 (9.09%)	11 (22%)	
CHD	3 (75%)	1 (25%)	4(8%)	
Others	2 (66.66%)	1 (33.33%)	3 (6%)	
Total	39	11	50	

The majority were 17 (34%) were found with Diabetes with Hypertension and in that 4 (23.52%) were with SSI, and 13 (76.47) were without SSI.

Table 10 : Patients were distribted according to Preoperative Hospital Stay Vs SSI

Preoperative Hospital Stay	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
0-1 Days	13	7	20 (40%)	0.01
2-6 Days	16	2	18 (36%)	
7-10 Days	10	2	12 (24%)	
Total	39	11	50	

Table 11 : Patients were distributed according to Prophylactic antibiotic Vs SSI

Prophylactic antibiotic	Without SSI Frequency (%)	With SSI Frequency (%)	Total	P-Value
Yes	28 (90.32%)	03 (9.67%)	31 (62%)	0.007
No	11 (57.89%)	08 (42.1)	19 (38%)	

Total	39	11	50	

The patients who took antibiotic prophylaxis were major 31 (62%), in that 3 (9.67%) with SSI frequency and 28 (90.32%) without SSI frequency . The P-Value is 0.007 and is significant.

Table 12 : Distribution according to Diagnosis

Diagnosis	Frequency	Incidence of SSI	Percentage
Inguinal Hernia	**14**	**1**	**7.14**
Incisional Hernia	**6**	**2**	**33.33**
Duodenal perforation	**4**	**3**	**75**
Illeal perforation	**2**	**1**	**50**
Acute Intestinal Obstruction	**3**	**1**	**33.33**
Appendectomy	**11**	**2**	**18.18**
Umbilical Hernia	**4**	**1**	**25**
Cholelithiasis	**6**	**0**	**0**

14 patients had inguinal hernia, out of which 1 (7.4%) were having SSI. 11 patients had Appendectomy, in that 2 (18.8%) had SSI.4 patients had duodenal perforation in which 3(75%) were seen with SSI. 2 patients had Ileal perforation, in this 1(50%) had SSI. Cholelithiasis in 6 patients and in no patients with SSI. Acute Intestinal Obstruction in 3 patients and out of that 1 (33.33%) with SSI and umbilical hernia in 4 patients out of which 1(25%) patients effected

Table 13 : Infection Rate in Use of Drain & Mesh

	Frequency	Infected	Incidence
Drain	**15**	**5**	**33.33**
Mesh	**24**	**4**	**16.66**

Table 14 : Infection rate in use of Cautery

	Frequency	Infected	Incidence
Cautery	**32**	**7**	**21.87**
Cautery not use	**18**	**4**	**22.22**

In our study patients with drain placed 33.33% showed SSI and patients with mesh showed 16.66% SSI. Patients with cautery showed 21.87% and patients cautery not used showed 22.22%.

Table 15 : Patients were distributed according to Organisms associated with SSI

Organisms	Frequency	Percentage

Staph. Aureus	**02**	**28.57**
Pseudomonas	**02**	**28.57**
E.Coli	**01**	**14.28**
Klebsiella	**02**	**28.57**
Total	**07**	

The Staphylococcus, Pseudomonas and Klebsiella accounted for 2(28.72%) each and E.Coli was identified in 1 (14.28%)

DISCUSSION

INCIDENCE IN ABDOMINAL INFECTION

The infection rate in present study was 22% among total 50 cases. The infection rate was 2.8% to 17% in other studies. The infection rate of SSI in different studies in India was 6.09% to 38.7% [4]. The infection rate in other countries is very low, in USA, it is 2.8% and in European countries 2-5%. In India the infection rate is very high due to poor set up of hospitals, lack of attention towards basic infection control measures.

GENDER

In other studies like Crystaell [9] et al and J can chir et al [18] shown the incidence ratio between male and female is 1.32:1 and 2.7:1 respectively. The significance of this observation is not well understood.

Women had significantly lower rates of SSI compared with men. In men, androgens have been shown to have a proinflammatory effect on wounds, impairing re-epithelialization, whereas in women estrogens have an anti inflammatory effect, which could account for this difference [11] .

AGE

The present study confirms the understanding that there is a gradual rise in incidence of wound infection as age advances. Likewise Cruse and Foord [12] , Naveen [13] Barwoff [15] et al (2006) and Mead,et al Dhamecha M [14] alsogot in their study that older patients are more likely to develop infection in clean wounds than younger patient. In our study high incidence is seen in above 70 years age group i.e.,40% , it may be due to decreased immune competence and increased chance of comrbid conditions like Diabetes mellitus, Hypertension, Anemia and CHD. Other conditions like smoking, alcoholism, age are also major risk factors for wound infection. In extreme of age 51-60 years, the infection rate is high because of increasing age, certain chronic conditions, malnutrition and fall in body's immunological efficiency

EMERGENCY / ELECTIVE

In elective surgeries SSI rate was found to be 16.66% and 25% in emergency cases. Similar to results obtained by Mahesh[7] C B et al, 2010 for elective 7.61% and for emergency 21.05% and J can chir et al[18] et al, 2019 for elective 45% and for emergency 54%. The high rates of infection in emergency surgeries can be attributed to inadequate pre operative preparation, underlying conditions which predisposed to the emergency surgery and more frequency of contaminated or dirty wounds.

OBESITY

High incidence of SSI frequency i.e.33% is seen in patients with BMI >30 kg/m^2, similar to Hoer J et al study.[19] One reason being decrease in blood circulation in fat tissues is associated with the increase in the infection rate.

ANAEMIA, DIABETES MILLETUS, HYPERTENSION

Incidence of post operative SSI is more among anemia, hypertension with diabetes due to

- Reduced immune competence
- Wound healing factors
- Hyperglycemia
- Preexisting infections

PRE -OP HOSPITALISATION

Increased incidence of SSI is seen in patients with less pre operative hospitalization due to no prophylactic antibiotic duration

ANTIBIOTIC PROPHYLAXIS

The antimicrobial prophylaxis reduced the microbial burden of the intra operative contamination to a level that could not overwhelm the host defenses. The preoperative antibiotic prophylaxis

- Decreases post operative morbidity
- Shorten the hospital stay and it could also
- Reduce the overall costs which attributable to the infection.

TYPE OF WOUND

The present study correlates with Mahesh C B[7] et al series, incidence of SSI is more among Dirty cases like bowel perforation were endogenous or the exogenous contamination of wound by organisms.

DURATION OF SURGERY

Prolonged duration of surgery increases the rate of exogenous infection which results in increased incidence of postoperative SSI.

DRAIN

Similar observations were made in other studies on SSI, and could be attributed to the nature of operation necessitating the drainage, the drain act as the portal of entry, or the effect of the drain itself. Abdominal SSI was noted most commonly on day 4 in our study. Similar results were obtained in other studies at Irani hospital 2005.

CAUTERY

The incidence of post operative SSI was high in patients where cautery was used intra operatively is 21.87%. Similar results were observed by Akihiro wantadbe[20] et al.

ORGANISM

Similar findings are seen in some studies like Umesh S[6]. In a prospective study of surgical site infections in a teaching hospital conducted by Kamat [16] 2008 showed 79.33% and Lagos Nigeria 2009 by Mofikoya Bo[17] et al showed 28% of Pseudomonas was the common isolate.. The present study showed predominant gram negative bacilli which are similar to other studies. Patient's endogenous flora are the most common causative organisms in SSI. In abdominal surgeries the opening of gastro intestinal tract increase the likelihood of coli forms, gram negative bacilli which was also observed in present study. This group of organisms tend endemic in hospital environment by being easily transferred from object to object, they also tend

to be resistant to common antiseptics and are difficult to eradicate in the long term. This group of organisms is increasingly playing a greater role in the many hospital acquired infections.

CONCLUSION

In present study the Incidence of abdominal surgical site infection is 22%. Majority of age group belong to 41-50 years which account for 26%. Emergency cases have high infection rate. Risk factors like anemia, diabetes mellitus, hypoproteinemia, RTI, UTI are associated with increased wound infection rate. Pre operative antibiotic is necessary in reducing SSI.

Use of drain and cautery increased the incidence of wound infection rate. Longer the duration of surgery more was the infection rate. Staphylococcus, Klebsiella,Pseudomonas being most common organisms isolated in the study.

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