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CLINICAL PROFILE OF ABDOMINAL SURGICAL SITE INFECTIONS

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ABSTRACT

Background: This is a study of Clinical profile of Abdominal surgical site infections in a tertiary care centre of north east India. It was conducted for a period of 2 years and results were analysed using appropriate statistical tools.

Methods: Study setting was General surgery department of RIMS, and study was conducted using interviews ,pre prepared questionnaire and routine follow up. Study was conducted for a period of 2 years.

Results: Total of 225 patients followed up 42 developed SSIs , with an incidence rate of 18.6% and around 88% of it was superficial SSI. According to age distribution maximum incidence was found in the age group 51-60 years. Out of the total 225 patients 120 were males and 105 were females, and incidence was found more in males and according to BMI distribution incidence was more in obese patients. Incidence was significantly higher in Diabetic patients and those who underwent emergency and open procedures compared to open procedures. The maximum number of surgeries in the study was cholecystectomies and appendicectomies.

Conclusion: This observational study has concluded that incidence of SSI in abdominal surgeries was 18.6% with maximum being superficial type. Maximum number of patients affected belonged to age group of 51-60 years, with males being affected more and incidence was more in emergency and open procedures.

Keywords – Surgical site infections (SSI), incidence, age, gender, type of surgery.

INTRODUCTION

Surgical wound is defined as the area of the body internally and externally, that involves the entire operative site. The commonest complications that can occur at surgical site following any surgical procedure include, a) Seroma b) Hematoma, c) Acute wound failure (Dehiscence) and d) Surgical site infections (SSI) / Wound infection. Surgical site infection is defined as infection that may occur within the surgical site at any depth, starting from the skin itself and extending to the deepest cavity that remains after dissection of an organ occurring within 30 days of the surgery. Surgical site infections are categorised in to three according to CDC criteria – Superficial, Deep space and Organ space.

Risk factors involved in the development of SSI include Patient factors like extremes of age, obesity, diabetes, malnutrition, skin flora, anaemia, hypo albuminemia, hypocholesterolemia, corticosteroid therapy, chronic inflammation, immunodeficiency etc. The environmental factors include inadequate skin antisepsis,disinfection/sterilisation. Treatment factors like drains, emergency procedures, inadequate antibiotic prophylaxis, prolonged operative time preoperative hospitalisation

Surgical Site Infections (SSI) develop as a result of contamination of surgical site with microorganisms the source of which is usually patient's flora (endogenous) when there is a breach in the integrity of skin or mucosa. This is an observational study on some of the aspects of surgical site infections among abdominal surgeries.

MATERIALS AND METHODS

The study was conducted among patients who underwent abdominal surgeries in General surgery department of Regional Institute of Medical Sciences, Imphal during a period from July 2015 to June 2017. A total of 225 patients were studied.

Inclusion criteria

Patients who underwent abdominal surgery including emergency and elective surgeries and patients who gave consent for the study.

Exclusion criteria

Surgeries other than abdominal surgery, Patients who were on steroids and immunosuppressive therapy, surgery done outside RIMS , patients who did not give consent for the study.

Study variables

The independent variables are age, sex, body mass index, co-morbidities type of surgery and type of SSI.

Statistical analysis

The data was entered and analysed by the SPSS 21 v, using Student's t-test for continuous variables and chi- square test for categorical variables.

Ethical approval

The study was conducted after getting clearance from the Institutional Ethics Committee.

RESULTS

This study was conducted in the Department of Surgery, RIMS, Imphal from July 2015 to June 2017. 225 patients who underwent abdominal surgeries were randomly selected and were followed up for a period of 30 days. Data were collected with a pre prepared proforma and analysed using SPSS 18. The following observations were made following the analysis; out of the total 225 patients followed up, 42 developed SSIs, with an incidence rate of 18.6%. Out of the total 225 patients, 120 were males and 105 were females, youngest patient was 2 years old and the oldest patient was 86 years old with maximum number of patients belonging to the age group of 31-40 years. According to the BMI distribution, 174 patients had their BMI in the normal range (18-23 Kg/m2) and 51 patients were obese (>23 Kg/m2). Among the co morbidities studied 23 patients had diabetes mellitus and 7 of them had deranged blood glucose levels at the time of surgery, 9 patients had hypertension and none of them had thyroid diseases.

176 patients underwent elective abdominal surgeries whereas 49 patients underwent emergency procedures, 200 surgeries were open procedures and 25 were laparoscopic procedures. Out of the 200 procedures 98 were cholecystectomies, 56 were appendicectomies, 25 cases of hollow viscus

perforation, 27 hernia surgeries, 9 cases of trauma,6 cases of tumors and 4 cases were resection anastomosis procedures.

TYPE OF SSIs

In the present study out of the 42 patients who developed SSIs thirty four were having superficial SSIs, two were having deep space infections and one patient developed organ space infection.

Table 1: Distribution of types of Surgical site infections

Types	No. of patients (n=42)	%
Superficial	37	88.09
Deep space	4	9.5
Organ space	1	2.3

AGE

Age of the patients under study ranged from 2 years to 86 years with a mean age of 39.82 ±18.76 and was distributed with 10 year frequency intervals. Maximum number of SSIs was found in age group of 51-60 years. The maximum number of patients with SSI belonged to the mean age group of 39.06±17.75.

Table 2: Age distribution of patients

Age in years	No. of patients	%
1-10	15	6.6
11-20	19	8.5
21-30	31	13.6
31-40	52	23.1
41-50	46	20.5
51-60	31	13.6
61-70	23	10.2
71-80	6	3.0
>80	2	2.6
Total	225	100.0

Table 3: Age wise distribution of SSI

Age in years	Surgical site infection		Total
	No	Yes	
1-10	13	2	15(7.5%)
11-20	16	3	19(9.5%)
21-30	28	3	31(15.5%)
31-40	23	8	52(21%)
41-50	35	6	41(18%)
51-60	44	13	36(15.5%)
61-70	20	3	23(9%)
71-80	3	3	6(3%)
>80	1	1	2(1%)
Total	183	42	225(100%)
Mean ± SD		45.49±20.33	39.82±18.76

GENDER

In this study 105 patients were females and 120 were males, out of which 17 female patients and 25 male patients developed SSIs. Sex wise distribution of patients was statistically significant with a p value of 0.049, being analysed using Chi-Square test.

Table 4: Sex distribution of patients under study in respect to SSIs

Gender	Surgical site infection		Total
	No	Yes	
Female	88	17	105
Male	95	25	120
Total	183	42	225
P=0.049*, Significant, Chi-Square test			

BMI

Patients were categorised into three groups based on their BMIs, <18 Kg/m^2, 18-23 Kg/m^2 and >23Kg/m^2 and maximum number of patients belonged to normal BMI group constituting 83.5 %. Occurrence of SSI was found to be maximum in the normal BMI age group and in the obese group, both of which were found to be moderately significant on statistical analysis with p-value of 0.016 and 0.032 respectively.

Table 5: BMI (kg/m^2) distribution of patients studied in relation to surgical site infections

BMI (kg/m^2)	Surgical site infection		Total (n=225)	P value
	No (n=176)	Yes (n=42)		
<18	3	1	4	0.337
18-23	149	30	179	0.016*
>23	28	11	42	0.032*
Chi-Square test/Fisher Exact test				

CO-MORBID CONDITIONS

Among the study population 8% had diabetes 4.5% had hypertension and none had thyroid disease. Out of the 20 diabetic patients 12 developed SSI. Association of diabetes with occurrence of SSI was strongly significant with a p-value of <0.001 and association with hypertension was statistically insignificant.

Table 6: Comorbid conditions distribution of patients studied

	No. of patients (n=32)	No of patients with SSI
DM	20	12
HTN	12	1
Thyroid Dse	0	0

TYPE OF SURGERY

Type of surgery has been categorized into four and in the present study elective surgeries has been compared with emergency surgeries for occurrence of SSIs ,similarly open surgeries has been compared to laparoscopic procedures. It was found that emergency surgeries has been strongly associated with occurrence of SSIs with a p- value of <0.001.Among open and laparoscopic procedures, open surgeries has been strongly associated with SSIs with a p value of 0.009.

Table 7: distribution of SSI with type of surgery

Type of surgery	Surgical site infection		Total (n=225)
	No (n=183)	Yes (n=42)	
Elective	168	8	176
Emergency	15	34	49
P value <0.001 chi-Square test/Fisher Exact test			

Table 8: distribution of SSI with type of surgery

Type of surgery	Surgical site infection		Total (n=225)	P value
	No (n=183)	Yes (n=42)		
Open	159	41	200	0.009**
Laparoscopic	24	1	25	0.053
Chi-Square test/Fisher Exact test				

DISCUSSION

The present study was carried out for a period of 2 years from July 2015 to June 2017 during which 225 patients who underwent abdominal surgeries in General Surgery department were randomly selected and were followed up for a period of 30 days after surgery. Out of 225 patients studied, 42 patients developed SSIs and the incidence rate was calculated to be 18.6%.

The variables in this study are as follows -

AGE- In this study maximum numbers of patients operated belong to the age group of 31-40 which formed 21% of total patients. Incidence of SSIs was highest in the age group of 51-60 years 24.3% of all SSIs. It was also observed that incidence of SSIs are maximum in the mean age group of this study i.e.; 38.42 ± 15.76 and such a distribution was statistically significant with a p-value of 0.041. This observation corresponds to the findings by Kaye KC *et al*[1] which states that risk of SSI increased by 1.1%/year between ages 17 and 65 years (P=.002) and at age ⩾65 years, risk of SSI decreased by 1.2% for each additional year (P=.008). Increasing age was found out as an independent risk factor for development of SSI in a prospective study by Scott JD *et al*[2].

GENDER

In the present study male gender was found to be a significant risk factor for development of SSIs with 67.6% of all SSIs developing in male patients and 32.4% of SSIs developing in female patients. The p-value of this distribution was 0.049 showing significance statistically and it was corresponding to the findings in a retrospective cohort study by Cohen B *et al*[3] which stated that men were at higher risk for bloodstream and surgical site infections, possibly due to differences in propensity for skin colonization or other anatomical differences.

BMI

In this study BMI was studied as a risk factor for development of SSI and was studied under three groups. Maximum number of patients that is 83.5% belonged to the normal BMI group and 18.5% belonged to the high BMI (obese) group. Maximum number of patients who developed SSI belonged to the normal BMI group that is 15.6 % of patients in this group, whereas 33.3% of patients in the high BMI (obese) group developed SSI. To conclude increased BMI was found to be a statistically significant risk factor for development of SSI with a p-value of 0.032. This was corresponding to the study by Sutton E *et al*[4].

Co-morbid conditions

In this study, co-morbidities studied were diabetes mellitus, hypertension and thyroid disease. Among all patients studied 16 were diabetic and 12 among them developed SSIs which constituted 32.4% of all SSIs. Diabetes mellitus was found to be significantly associated with development of SSIs with a p-value of <0.001 .This was correlating with the findings of the prospective study by Malone *et al*[5]. 9 patients were hypertensive out of which 1 developed SSI (2.7% of all SSI) but there was no statistically significant association between hypertension and development of SSIs, p-value being 1.0. Hypothyroidism was also considered for the study but was not significant statistically as none of the patients in this study was suffering from it.

Type of surgery

Type of surgery has been compared in 2 groups, one in which comparison was done between emergency and elective and the other in which comparison was done between open and laparoscopic procedures. In the present study 78% of patients had undergone elective surgeries whereas 22% emergency procedures. Incidence of SSIs was found to be 81% of total SSIs in the emergency group whereas it was 19% in the elective group. This distribution was found to be highly significant statistically with a p-value of <0.001 indicating that surgeries done in emergency setting had a very high risk of developing SSIs. This was corresponding to the findings by Hennessey D *et al* [6].

The second group was the one which compared open and laparoscopic procedures as a risk factor for development of SSIs. In this study 88% of patients had underwent open procedures and 12% had underwent laparoscopic procedures. Incidence of SSIs was found to be highest in the group which had underwent open procedures which constituted 98% of all SSIs. This was highly significant statistically with a p-value of <0.009 indicating that laparoscopic procedures are safer in respect to development of SSIs. This was corresponding to the findings by Amri *et al* [7].

CONCLUSION

This was a 2 year study from September 2015 to august 2017 conducted among the patients who had undergone abdominal surgeries in the Department of General Surgery in RIMS, Imphal.

A total of 225 patients were included in the study and the results obtained were as follows. The number of patients who developed SSI was 42 over a follow up period of 30 days and incidence of SSI in this study was 18.5%. The risk factors under study were age of the patient, sex of the patient, BMI, co-morbid condition and type of surgery. The significant findings from this study are as follows:

- Highest incidence of SSI in this study was in the age group of 51-60 years, constituting around 24.3% of all SSIs
- Male gender had slightly more risk of developing SSI
- Obesity was found to be strongly associated with SSI
- Diabetic patients were at high risk for developing SSI. Pre-operative hyperglycemia was found to be strongly associated with SSI
- Surgeries done in emergency setting had a higher risk of SSI
- Open procedures were associated with higher risk of SSI compared to laparoscopic procedures

Patients who developed SSI had significant morbidity in the form of prolonged hospital stay and increase in hospital expenses.

In this study incidence of SSI was found to be 18.5% , the risk factors associated with SSI were increased age of the patient, male gender, increased BMI, Type II Diabetes mellitus, surgeries done in emergency set up and open procedures, which corroborates with data from He *et al*[8].

All the risk factors and other variables were analysed systematically using appropriate statistical tools. This study will give some insight to precautions to be taken to prevent surgical site infections.

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