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A clinical study of post-operative wound infection in elective and emergency abdominal surgery.

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ABSTRACT: Background: Surgical site infection is the most common nosocomial infection and a major cause of post-operative morbidity and resource utilization. An infected wound can prolong hospitalization by 5 to 20 days and subsequently increase the medical cost. This study was performed with the aim to find out the incidence of Surgical Site Infection and to assess its relation with age, sex, duration of operation, wound drainage and co-morbidity among the elective and emergency abdominal surgeries in the surgical unit 1, Department of Surgery, Gauhati Medical College.

Methods: This cross-sectional observational study was carried out in the surgical unit 1, Department of Surgery at Gauhati Medical College and Hospital from July 2018 to June 2019. A total of 237 patients who underwent emergency or elective abdominal surgery were taken up for the study.

Results: During this period 237 patients underwent elective and emergency surgeries in the surgical unit 1, Department of Surgery, GMCH out of which 38 cases developed post-operative SSI with the infection rate being 16.03 %. Higher incidence of SSI was noted among the emergency cases (37 %). Higher incidence of SSI was found with increasing age, diabetes, obesity, and in contaminated & dirty cases. Commonest organism isolated was Escherichia-coli (39.13 %).

Conclusion: Post-operative wound infections represent a substantial burden of disease both for the patients and health services in terms of the morbidity and economic costs. Employing methods that could reduce the incidence of SSI, would reduce patient morbidity and lessen the associated economic burden.

I. INTRODUCTION:

Post-operative wound infection also known as surgical site infection is a major cause of postoperative morbidity, prolonged hospital-stay and increased health care cost. As defined by the Center For Disease Control Prevention (CDC) these infections typically occur within 30 days of operation (at the site of operation) or within a year if an implant is left in place and is thought to be secondary to surgery. Based on the reports by the National Nosocomial infection Surveillance System (NNIS) established in 1970, SSI are the most frequently reported nosocomial infection accounting for 14% to 16% of all hospitalized patients[1-4]. In the modern day despite the advances in perioperative & postoperative wound care measures, wound infection remains a substantial cause of morbidity and increased health care cost among hospitalized patients. Bacterial colonization on the patient's skin & alimentary & genital tract are the principal contributing sources that lead to SSI. The organism most often isolated is Escherichia-coli. A number of factors are reported to increase the likelihood of post-operative infections. e.g age, duration of surgery, type of surgery, type of wound, comorbid conditions like Diabetes Mellitus, obesity etc. Most of the postoperative wound infection are preventable with appropriate use of prophylactic antibiotics. In order to assess the success of infection prophylaxis, a standard acceptable and effective hospital infection control program should be created for which information regarding pattern of post-operative wound infection is essential. Employing methods that could reduce incidence of SSI would significantly reduce patient's morbidity and associated economic burden.

AIM: The aim of the study was to establish rate of infection and assess its relation with age, sex, type of operation(elective/emergency), duration of operation, type of wound, use of drain , and co-morbidity.

MATERIAL & METHODS: Place of study: Surgical unit 1, Department of Surgery, Gauhati Medical College and Hospital. A total number of 237 patients undergoing various

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abdominal surgery from the month of July 2018 to June 2019, in the surgical unit 1 were taken up for the study.

INCLUSION CRITERIA: Patients admitted in the surgical unit 1, department of surgery, GMCH undergoing elective and emergency operations.

EXCLUSION CRITERIA:

• Patients less than 10 years and more 60 years.
• Patients with Immunosuppression
• Infection occurring more than 30 days after surgery.

II. RESULTS AND OBSERVATION:

This study included 237 patients who underwent elective and emergency abdominal operation in the surgical unit 1, department of Surgery, GMCH from the period of June 2018 to July 2019.The following observations were made from the study. Out of these 237 patients, 38 patients developed post-operative wound infection. Over all incidence of postop wound infection was 16.03%. Study showed higher incidence of wound infections with increasing age, with highest incidence (38.46 %) occurring in the age group of 51-60 years. Males had higher incidence of infection (22.34 %) as compared to females. Incidence is higher in emergency surgeries (37 %) as compared to elective surgeries (9.83%). Incidence of wound infection in clean-wound, clean contaminated wound, contaminated wound and dirty wound were 8.88%, 9.42%, 31.25% and 39.47 % respectively. The study showed increase in incidence of post-operative wound infections with increase in duration of surgery. Diabetics and obese individuals had a higher incidence of wound infection. Wound infections were higher with the use of drain. In this study, the most common organism isolated was Escherichia-coli followed by Klebsiella and Pseudomonas. Gram negative organisms showed resistance to antibiotics like Cefuroxime, ceftriaxone, cotrimoxazole and ciprofloxacin. Staphylococcus aureus showed resistance to Levofloxacin, ciprofloxacin, and azithromycin.

1. Incidence of post-operative wound infection:

Out of 237 cases, 38 patients had post-operative wound infection with an incidence of 16.03%.

No of cases	No of infection	Percentage (%)
237	38	16.03%

2. Age of patient: Increased incidence of infection were seen in elderly with maximum of incidence between the age group 51 to 60 years.

Age group(years)	No of cases	No of infection	percentage
11 to 20	15	1	6.66%
21 to 30	56	4	7.14%
31 to 40	78	12	15.38%
41 to 50	63	11	17.46%
51 to 60	26	10	38.46%

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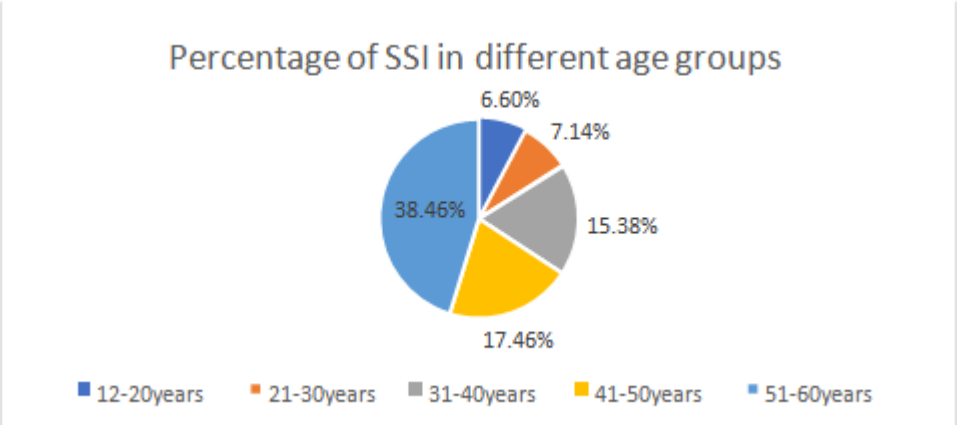

3. Sex Difference:

Males had higher incidence of wound infection compared to females.

Sex	Total No Of Cases	No of patients with infections	Percentage
Male	94	21	22.34
Female	143	17	11.88

4. Elective/Emergency:

Emergency cases had higher incidence of infection compared to elective cases.

Type of surgery	No .of cases	No. of infections	Percentage
Elective	183	18	9.83%
Emergency	54	20	37.0%

5. Incidence of SSI in relation to operative time:

Incidence of wound infection increases with an increase in operating time.

Duration	No of Case	No of infection	Percentage
<1hr	114	7	6.14
1 – 2 hr	89	18	20.22
>2hr	34	13	38.23

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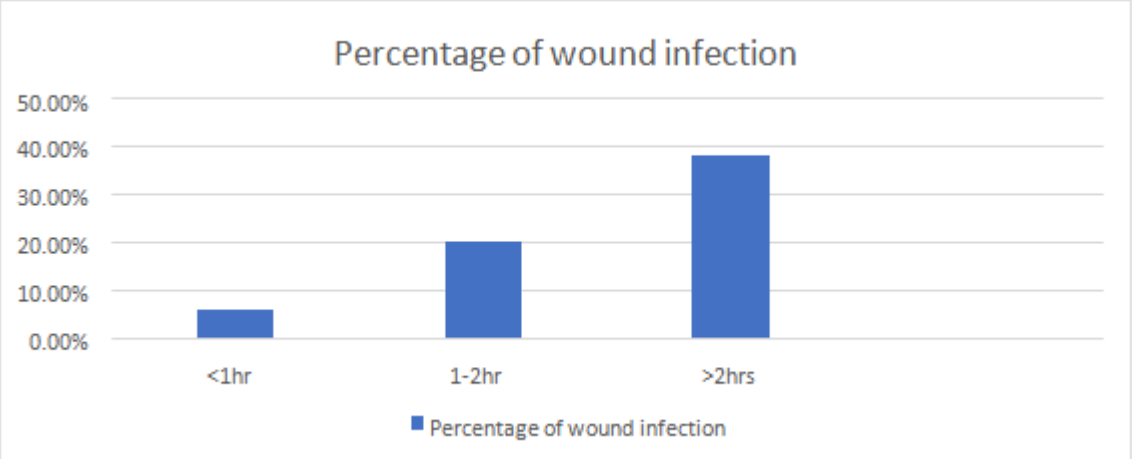

6. Incidence of SSI in Diabetic patients:

The presence of diabetes increased the occurrence of wound infection.

		No of patients undergoing surgery	No of patients with wound infection	percentage
Diabetic	Elective	18	4	22.22
	Emergency	5	3	60%
Non - Diabetic	Elective	165	15	9.09
	Emergency	49	16	32.65

7. Obesity and wound infection:

Increased incidence of wound infection was noted with obesity.

	No of Cases	No. of infections	Percentage
Obesity	14	6	42.85%

8. Risk of SSI in relation to Drain:

	No of cases	No of infections	Percentage
Drain used	180	33	18.33
Drain not used	57	5	8.77

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9. Incidence In relation to wound class:

A) Clean Wound: Class I

Operation	No of cases	No of Infection
Inguinal hernia	39	3
Other hernia	6	1
Total	45	8.88%

B) Clean contaminated: class II

Operation	**No of cases**	**No of infection**
Cholecystectomy	**72**	**5**
Choledocholithotomy	**12**	**2**
Appendicectomy	**38**	**3**
Resection & Anastomosis	**4**	**1**
APR	**3**	**1**
GJ	**9**	**1**
Total	**138**	**13(9.42%)**

C) Contaminated: class III

Operation	**No of cases**	**No of infection**
Intestinal obstruction	**13**	**4**
Stab wound	**3**	**1**
Total	**16**	**5(31.25%)**

D) Dirty Wound: class IV

Operation	**No of cases**	**No of infection**
DU perforation	**20**	**6**
Gastric perforation	**4**	**2**
Ileal perforation	**7**	**3**
Appendicular abscess	**7**	**4**
Total	**38**	**15(39.47 %)**

Incidence of wound infection in clean-wound, clean contaminated wound, contaminated wound and dirty wound were 8.88%,9.42%,31.25% and 39.47% respectively

10. INCIDENCE OF WOUND INFECTION IN RELATION TO DIFFERENT ABDOMINAL OPERATION:

SL.no	**Operation**	**No of cases**	**Infection**
1.	Cholecystectomy	**72**	**5**
2.	Choledocholithotomy	**12**	**2**
3.	Appendicectomy	**38**	**3**
4.	Inguinal hernia	**39**	**3**
5.	Other hernia	**6**	**1**
6.	GJ	**9**	**2**
7.	Resection & anastomosis of	**4**	**1**

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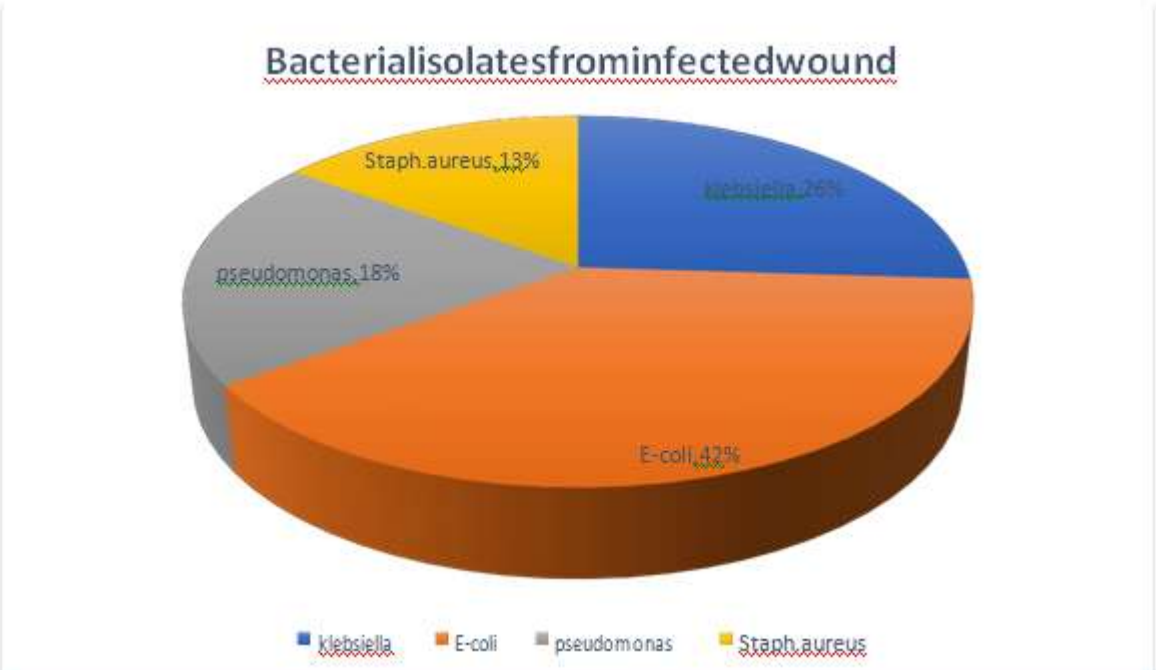
8.	APR	**3**	**1**
9.	Intestinal obstruction	**13**	**4**
10.	DU perforation	**20**	**6**
11.	Gastric perforation	**4**	**2**
12.	Ileal perforation	**7**	**3**
13.	Appendicular abscess	**7**	**4**
14.	Stab wound injury	**3**	**1**

11. Type of bacterial isolates from infected cases:

Organism	Elective cases showing positive culture	Emergency cases showing positive culture	Percentage(%)
Escherichia Coli	6	10	42.10
Klebsiella	3	7	26.31
Pseudomonasaeruginosa	2	5	18.42
Staphylococcus	4	1	13.15



12. Antibiotic sensitivity of the Bacterial isolates:

In the present study Escherchia-coli was found to be 100% sensitive for Imipenam, Meropenem and Ceftriaxazone-tazobactum. Sensitivity was also seen for amikacin, gentamicin and piperacillin-tazobactum. Klebsiella and pseudomonas were sensitive for amikacin, gentamicin, imipenem, Meropenem. piperacillin – tazobactum was found to be 88 % sensitive for pseudomonas. Linezolid was the most sensitive antibiotic for Staph.aureus followed by the third generation cephalosporins

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S.no	Antibiotic	E-coli(%)	Klebsiella(%)	Pesudomonas(%)	Staph.aureus(%)
1.	Cefuroxime	5.5	8.3	-	85.7
2	Cefixime	-	-	-	28.5
3	Cefotaxime	22.2	8.3	-	71.4
4	Ceftazidime	-	8.3	-	71.4
5	Ceftriaxone	16.6	8.3	-	-
6	Cloxacillin	-	-	-	85.7
7	Oxacillin	-	-	-	85.7
8	Gentamicin	61.1	16.6	50	85.7
9	Amikacin	72.2	58.3	50	-
10	Ciprofloxacin	22.2	-	-	14.2
11	levofloxacin	27.7	-	22.2	14.2
12	ofloxacin	22.2	-	-	-
13	Azithromycin	-	-	-	14.2
14	Tetracycline	-	-	-	85.7
15	Doxycycline	-	-	-	28.5
16	Linezolid	-	-	-	100
17	Imipenem	100	100	100	14.2
18	Meropenem	100	100	100	-
19	vancomycin	-	-	-	100
20	PolymyxinB	-	37.5	-	-
21	Ertapenem	-	12.5	-	14.2
22	Cotrimoxazole	5.5	8.3	22.2	57.1
23	Pipercillin-tazobactum	77.7	33.3	88.8	14.2
24	CeftriaxazoneTazobactum	100	80	-	-

III. DISCUSSION:

This study included 237 patients who underwent elective and emergency abdominal operation in the department of Surgery, GMCH. Post-operative wound infection was found in 38 patients with an overall incidence of 16.03 %. Garibaldi et al[5] (1991) and Gupta et al[6] (1996) found the incidence to be 5.60 % and 15 % respectively. Ageing have been reported to increase the likelihood of wound infection with highest incidence of wound infection in the age group of 51 to 60 years and lowest incidence in the age group of 11 to 20 years. Williams et al[7] (1972), Olson et al[8] (1990) and Scott et al[9] (2001) also reported higher incidence of infection in older age groups. In the present study 22.3 % of males and 11.8% of females had wound infection. Walsh et al[10] (1981) also recorded higher infection rate in males compared to females. Post op wound infection was higher in emergency surgeries (37 %) compared to elective surgeries (9.8 %). In our study the wound infection rate for clean, clean contaminated, contaminated, and dirty cases were 8.8 %, 9.4 %, 31.2 %, and 39.47 % respectively. Cruse and Foord[11] (1973) showed a wound infection rates of 1.8 %, 8.9 %,21.5 %, and 38.3 % respectively for the different wound types. Sangrasi et al[12] (2008) found the infection rates to be 5.4%, 12.3 %, 36.3% and 40 % respectively.

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Study	Clean (in%)	Clean contaminated(in%)	Contaminated(in%)	Dirty (in%)
(Cruse and Foord 1973)[11]	1.8 %	8.9 %	21.5 %	38.3 %
(Culver, Horanet al. 1991)[13]	2.1 %	3.3 %	6.1 %	7.4 %
(Sangrasi,Leghari e tal.2008)[12]	5.4 %	12.3 %	36.3 %	40 %
(Agarwal,Agarwal et al.1984)[14]	36.17 %	57.14 %	100 %	-
(Kamat,Fereirra et al ,2008)[15]	5.4 %	35.5 %	77.8 %	-
The present study	8.88 %	9.03 %	33.33 %	40.81 %

In our study we found that incidence of SSI increased with duration of surgery (< 1 hour6.14%, 1-2 hour- 20.22%, >2 hour- 38.23%) . Cruse and Foord[11] (1973) found that rate of wound infection increased with longer procedures; roughly doubling with every hour of the procedure. In 1985 Haley et al[16] found that surgeries longer than 2 hours were predictive of wound infection. Diabetics had higher incidence of wound infection compared to non-diabetics. William G.Cheadle[17] (2006) found that diabetes increases the risk of SSI. Obesity was found to increase the risk of SSI with 42.85 % of obese individual developing SSI. Lynch, Ranney et al[18] (2009) showed that obesity is an independent risk factor for the development of SSI. Incidence of post-operative infections were higher in cases where drain was used (18.33 %) compared to cases without drain (8.77 %). Similar observation was made by Cohen (1998)[19] . Commonest organism isolated in this study was Escherichia Coli followed by klebsiella and pseudomonas. Similar result was shown by Vilar-Compte, Mohar et al[20] (2000) and Agarwal et al[14] (1984) . Kowli, Nayak et al[21] (1985) and Anbumani, Kalyan et al[22] (2006) showed Staphylococcus aureus as the most common organism. In this study Gram negative organism showed resistance to antibiotics like cefuroxime, ceftriaxone, cotrimoxazole and ciprofloxacin. Staphylococcus aureus showed resistance to Levofloxacin, ciprofloxacin, and azithromycin.

IV. CONCLUSION:

Post-operative wound infections represent a substantial burden of disease both for the patients and health care system in terms of the morbidity and economic costs. Although surgical wound infections cannot be completely eliminated, a reduction in the infection rate to a minimal level may have significant benefits. This may be achieved by meticulous surgical techniques, minimizing the duration of operation, proper sterilization, hygienic operation theatres, and ward environments. Control of obesity, treatment of infective foci, and diseases like diabetes mellitus may help in controlling the morbidity associated with surgical wound infections. Improper and the prolonged use of antibiotics should be avoided, as this can lead to the development of resistance strains of microorganisms.

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