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A Clinical Study of Wound Infection in Emergency Abdominal Surgeries in Tertiary Care Hospital

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Abstract
INTRODUCTION :
Abdominal surgeries are one of the most common operations performed as an emergency procedure[1]. After these surgeries in the postoperative period, surgical site infection is one of the most common complications leading to superficial wound disruption or burst abdomen resulting in increased postoperative hospital stay. Later it may also result in incisional hernia. Postoperative wound infection was considered a surgeons nightmare. It is the third most common cause of nosocomial infection and is highly associated with morbidity and mortality.
OBJECTIVES :
To know the incidence of wound infection based on
A. Different types of emergency abdominal surgeries
B. Duration of illness
C. Associated co-morbidities.
MATERIALS AND METHODS:
This study is a prospective study carried out on 100 emergency abdominal surgeries.
Infected samples from patients were collected by following all aseptic precautions and were processed without delay by the standard microbiological techniques.
RESULTS AND CONCLUSION:
The overall infection rate was 20%. The SSI rate was 10.9% in clean-contaminated ones, 21% in contaminated ones and 85% in dirty surgeries. Male patients were affected more (22.7%) than female patients (14.7%). The SSI rate increased with increasing age, and it also increased significantly with the increasing duration of illness and duration of surgery. The most commonly isolated organism from surgical site infections was Escherichia coli (45%), followed by staphylococci (30%) and other bacteria.

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I. IMaterials And Methods

SOURCE OF DATA
The material for the present study was obtained from patient's who have undergone emergency abdominal surgery in the Department of General Surgery, SVRRGGH,
INCLUSION CRITERIA :
Patients of age more than 18 yrs presenting with acute abdomen in need of emergency abdominal surgery.
EXCLUSION CRITERIA
Patients not willing to participate in the study,Patients who died within 24 hrs of the postoperative period

SAMPLE SIZE: 100 patients are included in the study who have fulfilled the Inclusion criteria.
Methodology

An elaborate study of these cases with regard to date of admission, history, clinical features of wound infection, type of surgery, preoperative preparation and postoperative management is done till the 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 a sterile cotton swab and was sent to microbiology department for culture and sensitivity.

II. Results

This study included 100 Emergency abdominal surgical patients, out of which 20 were infected. So the incidence is 20%.

Table 1: Incidence of wound infection in emergency

Total no.of cases	No.of cases infected	Percentage
100	20	20%

abdominal surgeries

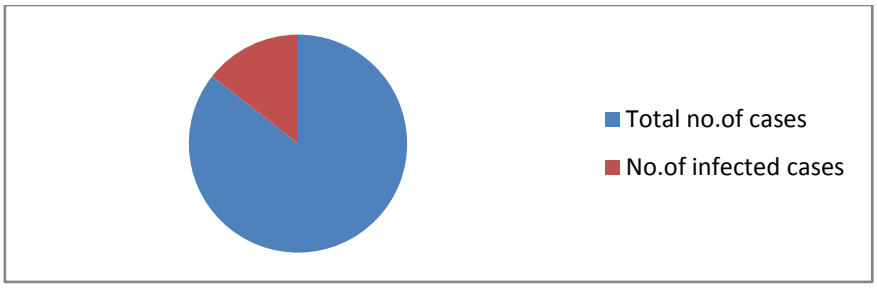

Chart 1: Incidence of wound infection in emergency abdominal surgeries

Table 2: Incidence of wound infection in relation to sex

Sex	No.of cases	No.of infected cases	Percentage
Male	66	15	22.7%
Female	34	5	14.7%

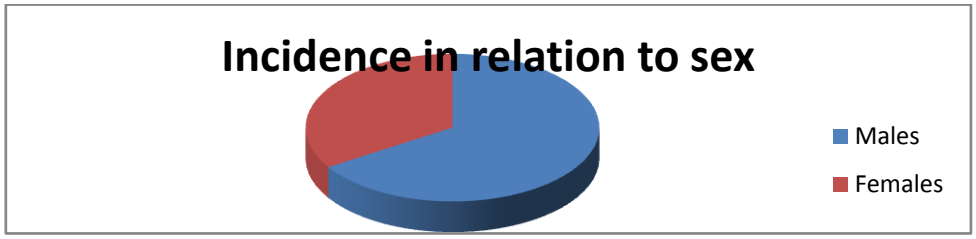

Chart 2: Incidence of wound infection in relation to sex

Out of 100 patients 66 were male patients among which 15 cases got infected with incidence being 22.7% and out of 34 female patients only 5 cases got infected with incidence being 14.7%
Therefore the incidence was more (22.7%) in males than compared with females (14.7%).

Table 3: Incidence of wound infection in relation to Age

Age group(in yrs)	No.of cases	No.of infected cases	Incidence
18-28	16	3	18.7%
29-38	25	3	12%
39-48	23	2	8.69%
49-58	26	5	19.2%
59-68	6	6	100%
69-78	4	1	25%
Total	100	20	

Out of 100 patients, 16 patients were of age group 18-28yrs among which 3 cases got infected with incidence being 18.7 %, 25 patients were of age group 29-38yrs among which 3 cases got infected with incidence being 12%,23 patients were of age group 39-48yrs among which 2 cases got infected with incidence being 8.69%,26 patients were of age group 49-58yrs, out of which 5 cases got infected with incidence being 19.2%,6 patients were of age group 59-68yrsout of which all the 6 cases got infected with incidence being 100% and 4 patients were of age group 69-78yrs out of which 1 case got infected with incidence being 25%. Therefore, as per the study incidence of wound infection is more among patients belonging to age group 59-68yrs.

Table 4: Incidence of wound infection in relation to BMI

BMI (kg/m^2)	No.of cases	No.of infected cases	Incidence
<20	17	4	23.5%
20.1-25	40	6	15%
25.1-30	30	5	16.6%
>30	13	5	38.46%
Total	100	20	

Out of 100 patients, 17 patients fall under BMI range of <20kg/m2 out of which 4 cases got infected with incidence being 23.5%,40 patients fall under BMI range of 20.1-25 kg/m2 out of which 6 cases got infected with incidence being 15%,30 patients fall under BMI range of 25.1-30 kg/m2 out of which 5 cases got infected with incidence being 16.6%and 13 patients fall under BMI range of >30kg/m2 out of which 5 cases got infected with incidence being 38.46%. Therefore, as per the study incidence of wound infection is more among patients with BMI range >30kg/m2 (38.46%).

Table 5: Incidence of wound infection in relation to Anaemia and Diabetes mellitus

Comorbidity	No.of cases	No.of infected cases	Incidence
Anemia	32	6	18.7%
Diabetes mellitus	31	9	29%

Out of 100 patients 32 cases were diagnosed to have anaemia out of which 6 cases got infected with incidence being 18.7% and 31 cases were diagnosed to have diabetes mellitus out of which 9 cases got infected with incidence being 29%. Therefore, as per the study, the incidence of wound infection in patients with anaemia is 18.7% and in patients with diabetes mellitus is 29%.

Table 6: Incidence of wound infection in relation to duration of illness

Duration of illness	No.of cases	No.of infected cases	Percentage
<5 days	86	6	6.97%

Out of 100 patients, the duration of illness was less than 5 days among 86 patients out of which 6 cases got infected with incidence being 6.97%and duration of illness was more than 5 days among 14 patients out of which 14 cases got infected with incidence being 100%. Therefore, as per the study incidence of wound infection is higher in patients presenting with duration of illness for more than 5 days.

Table 7: Incidence of wound infection in relation to diagnosis

Diagnosis	No.of cases	No.of infected cases	Incidence
Duodenal perforation	25	8	32%
Ileal perforation	1	0	0
Acute appendicitis	35	4	8.8%
Appendicular perforation	10	5	50%
Gallbladder perforation	3	1	33.33%
Obstruction	7	0	0
Obstructed hernia	3	2	33.33%
Blunt trauma abdomen	10	0	0
Gastric perforation	6	0	0
Total	100	20	

Out of 100 patients, 25 cases were duodenal perforation out of which 8 cases got infected with incidence being 32%,1 case was of ileal perforation out of which no cases got infected, 35 cases were Acute appendicitis out of which 4 cases got infected with incidence is 8.8%,10 cases were Appendicular perforation out of which 5 cases got infected with incidence being 50%,3 cases were gall bladder perforation out of which 1 case got infected with incidence being 33.33%,7 cases were obstruction out of which no case got infected, 3 cases were obstructed hernia out of which 2 cases got infected with incidence is 33.33%,10 cases were blunt trauma abdomen out of which no case got infected and 6 cases were gastric perforation out of which no case got

infected. Therefore, as per the study, the incidence of wound infection is more in patients with appendicular perforation (50%), followed by 33.33% in gall bladder perforation and in obstructed hernia 32% in duodenal perforation and least being 8.8% in acute appendicitis cases.

Table 8: Incidence of wound infection in relation to the type of wound

Type of wound	No.of cases	No.of infected cases	Incidence
Clean contaminated	55	6	10.9%
Contaminated	38	8	21%
Dirty	7	6	85%

Out of 100 patients, 55 cases fall under clean-contaminated wound category out of which 6 cases got infected with incidence being 10.9%,38 cases fall under contaminated wound category out of which 8 cases got infected with incidence being 21%,7 cases fall under dirty wound category out of which 6 cases got infected with incidence being 85%. Therefore, as per the study, the incidence of wound infection is more among patients falling under the category of dirty wounds (85%)followed by contaminated wounds (21%) and clean-contaminated wounds (10.9%).

Table 9: Incidence of wound infection in relation duration of surgery

Duration	No.of cases	No.of infected cases	Incidence
<2hrs	65	9	13.8%
>2hrs	35	11	31.45%

Out of 100 patients, duration of surgery was <2hrs in 65 cases out of which 9 cases got infected with the incidence being 13.8% and the duration of surgery was >2hrs in 35 cases out which 11 cases got infected with incidence being 31.45%. Therefore, as per the study incidence of wound infection is more among the patients with duration of surgery >2hrs (31.45%).

Table 10: Incidence of wound infection in relation to organisms isolated

Organism Isolated	No.of cases	Incidence
Escherichia coli	9	45%
Staphylococcus aureus	6	30%
Klebsiella	4	20%
Pseudomonas	1	5%
Total	20	

Out of 100 patients 20 cases got infected out of which Escherichia coli was the organism isolated in 9 cases with incidence being 45%, Staphylococcus aureus was isolated in 6 cases with incidence being 30%, klebsiella was isolated in 4 cases with incidence being 20%and pseudomonas was isolated in one case with the incidence being 5%. Therefore, as per the study, Escherichia coli is the most common organism isolated in infected cases with incidence being 45%.

Fig. 4: Clinical pictures of Surgical site infection

III. Discussion

The present study was conducted at the General Surgery Department SVRRGGH, Tirupati. This is a prospective study of100 cases that have undergone emergency abdominal surgery in SVRRGGH and were followed up from the day of operation to 30 days after discharge.The overall infection rate for a total of the 100 cases was 20%. The incidence rate in this study is more than 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%. 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.
The following table shows the incidence in various other studies.

Author	Year	Country	No.of operations	Infection
Cruse and Foord	1980	Canada	62939	4.7%
Edwards	1984	U.S	20,193	2.8%
Anvikar et al	1999	India	3280	6.09%
Umesh s et al	2008	India	114	30.7%
Mahesh c b et al	2010	India	418	20.9%

The rates of abdominal SSIs in male patients were 22.7% and in female patients, they were 14.7%. The significance of this observation is not well understood.

Age

The present study confirms the understanding that there is a gradual rise in incidence of wound infection as age advances. The incidence showed a gradual rise from 18.7% in the 18-28yrs age groups to 100% in patients more than 60 years. Likewise Cruse and Foord observed in their study that older patients are more likely to develop infection in Clean wounds than younger patient. Similar findings were demonstrated by Mead, et al, who observed an increased wound infection in patients less than 1 year old (2.7%) or greater than 50 years old (2.8%) versus those 1 to 50 years old (0.7%). The high incidence of 100% in patients above 60 years, in our study, is perhaps due to decreased immunocompetence and increased chances of co-morbid factors like Diabetes Mellitus, Hypertension, Chronic ailments like Asthma, Arthritis, conditions requiring Steroid therapy and personal habits like Smoking and Alcoholism. Age obviously is an immutable patient characteristic and even, if it is a risk factor for wound infection, it appears to be at most a modest one.

Emergency

The SSI rate in elective surgeries was found to be 20%. Our results are compared well with the results obtained by other workers. Similar results were obtained in Mahesh C B et al, 2010 for emergency 21.05%. The high rates of infection in emergency surgeries can be attributed to inadequate pre operative preparation, the underlying conditions which predisposed to the emergency surgery and the more frequency of contaminated or dirty wounds in emergency surgeries.

Obesity

In this study both low (23.5%) and high (38.6%), BMI is associated with an increased incidence of infection. Similar results were obtained in Hoer J et al study. One reason being a decrease in blood circulation in fat tissues is associated with the increase in infection rate.

Anaemia,diabetes mellitus

Incidence among the risk factors like anaemia 18.7%, diabetes mellitus 29%. Similar results were also obtained in other studies. Cause being the reduced immunocompetence, wound healing factors, hyperglycemia, and preexisting infections.

Duration of illness

Duration of illness of more than 5days had an incidence of of100 %. The rates of SSIs increased with the increasing duration of illness. A longer duration of illness reflected the severity of the illness Similar results were obtained in other studies like in the study by Syed Mansour Razavi et al which showed 1- 15 days of pre-op admission had SSI of 18.6% whereas more than 15 days had an infection rate of 25.9%. NongyaoKasatqibal et al 2006 also had increased risk of SSI with increasing duration pre operative hospital stay.

Type of wound

In this study incidence in relation to the type of surgery, clean contaminated had incidence of 10.9%, contaminated cases had 21% and dirty cases had an infection rate of 85%. LulRaka et al in 2006 at Kosovo Teaching Hospital had the incidence rate of SSI differed by wound classification: 9.8% for clean-contaminated (n=143), 46.1% for Contaminated (n=13), and 100% for dirty infected wounds (n=5). The relative risk of development SSI for contaminated wounds was 5.4-fold higher than for clean wounds.

Seyd Mansour Razavi 2005 at an Iranian teaching hospital found clean wounds in 109 cases (13.6%); clean-contaminated wounds in 214 cases (26.7%); contaminated wounds in 307 cases (45.8%); and dirty infected wounds in 112 cases (14%). Mahesh C B et al in 2010 at Bagalkot had an SSI rate of 11.53% in clean surgeries, 23.33% in clean-contaminated ones, 38.10% in contaminated ones and 57.14% in dirty surgeries. Our study correlates with the Mahesh C B et al series, incidence among dirty cases are more due to most of the cases were bowel perforation cases. Clean cases dint had any infection in the study group is probably due to the use of pre-op antibiotic in all the cases.

The difference in the rates of SSIs between the clean-contaminated and the contaminated wounds showed the effect of endogenous contamination and the difference in the rates of SSIs between the clean-contaminated and the dirty wounds showed the effect of exogenous contamination. The endogenous or the exogenous contamination of the wounds by the organisms had a profound influence on the SSIs. 65 cases had an operation in less than 2hrs with the incidence of infection of 13.8%, 35 of cases had operation in more than 2hrs with an incidence of infection of 31.45%. Incidence was more in a longer duration of surgery. Similar results were present in many studies, Seyd Mansour Razavi 2005; LulRaka et al in 2006, Mahesh C B et al in 2010 all had similar results.

Diagnosis

Out of 100 patients, 25 cases were duodenal perforation out of which 8 cases got infected with incidence being 32%,1 case was of ileal perforation out of which no cases got infected, 35 cases were Acute appendicitis out of which 4 cases got infected with incidence is 8.8%,10 cases were Appendicular perforation out of which 5 cases got infected with incidence being 50%,3 cases were gall bladder perforation out of which 1 case got infected with incidence being 33.33%,7 cases were obstruction out of which no case got infected, 3 cases were obstructed hernia out of which 2 cases got infected with incidence is 33.33%,10 cases were blunt trauma abdomen out of which no case got infected and 6 cases were gastric perforation out of which no case got infected.Therefore, as per the study, the incidence of wound infection is more in patients with appendicular perforation (50%), followed by 33.33% in gall bladder perforation and in obstructed hernia 32% in duodenal perforation and least being 8.8% in acute appendicitis cases.

Organism Most common organism isolated in our study is Escherichia coli 45%, followed by staphylococci 30%, klebsiella 20% and Pseudomonas 5%. some studies like Umesh S. Kamat121 2008 Seventy-nine per cent (79.33%) of the isolates were gram-negative bacteria; pseudomonas being the commonest one, followed by Staphylococcus pyogenes in the prospective study of surgical site infections in a teaching hospital in Goa. Pseudomonas was the most common isolate in other studies like Mofikoya Bo et al Bacterial Agents of Abdominal Surgical Site Infections in Lagos Nigeria in 2009. 25(17.4%) of the 144 patients studied developed surgical site infections. Pseudomonas was the most frequently cultured aerobic organism in 28% (n=7) of the cultures, while Bacteroides species was the most common anaerobe isolated. Our findings of a predominance of gram–ve bacilli are similar to that of other workers. In most cases of SSI, the organism is usually the patient's endogenous flora.

In abdominal surgeries, the opening of the gastrointestinal tract increases the likelihood of coliforms, gram-negative bacilli which were our finding in this study. This group of organisms tends to be endemic in the 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 many hospital-acquired infections.

The conditions responsible for SSI other than included in this study are - personal hygiene, immunological disorders, smoking, techniques of surgery, duration of surgical scrub, pre-operative skin preparation, failure to obliterate dead space, and inadequate sterilization of instruments.

IV. Conclusion

Incidence of abdominal surgical site infection at SVRRGGH is 20% ,Majority of patients belong to age group of 49-58 years which account for 26%. ,Out of 100, 40 patients had BMI in the range of 20.1- 25, whereas infection was more among low and high BMI patients accounting for 15% and 38.46% respectively.32 patients were anaemic who had an incidence of 18.7% of infection. 31 patients werediabetic, had 29% infection rate. 86 cases had less than 5 days duration of illness, among which the incidence of wound infection is 6.97%,14 cases had more than five days duration of illness among which the incidence of wound infection is 100%,The incidence of wound infection is more in patients with appendicular perforation (50%), followed by 33.33% in gall bladder perforation and in obstructed hernia 32% in duodenal perforation and least being 8.8% in acute appendicitis cases.

The incidence of wound infection is more among patients falling under the category of dirty wounds (85%) followed by contaminated wounds (21%) and clean-contaminated wounds (10.9%).The study incidence of wound infection is more among the patients with duration of surgery >2hrs (31.45%).The incidence of wound infection is more among patients falling under the category of dirty wounds (85%) followed by contaminated wounds (21%) and clean-contaminated wounds (10.9%).Longer the duration of surgery more was the infection rate. Escherichia coli was the most common organism isolated in this study. Most of the organisms were isolated from the dirty wound.

References

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