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A Clinical Study on Surgical Site Infections in Abdominal Surgeries in Tertiary Care Hospital

Dr.Kathiravan Theerthagiri
Assistamt Professor of Surgery, Government Dharmapuri Medical College

Dr.Selvaraj Seerangagounder
Assistamt Professor of Surgery, Government Dharmapuri Medical College

Abstract
Introduction*: Surgical site infections (SSI) remain a significant problem following an operation and the third most frequently reported nosocomial infections. The current study was undertaken to identify incidence of SSI and the risk factors associated with it, and the common organism isolated and its antibiotic sensitivity and resistance after abdominal surgeries.*
Material and Methods: *The retrospective study was carried out on 100abdominal surgeries. Infected samples from patients were collected by following all aseptic precautions and were processed without delay by the standard microbiological techniques*
Results and Conclusions: *The overall infection rate was 15%. The SSI rate was 0% in clean surgeries, 9% in clean contaminated ones, 25% in contaminated ones and 53% in dirty surgeries. The SSI rate increased with increasing age and it also increased significantly with the increasing duration of pre-operative hospitalization. The SSI rate was less in patients who received pre- operative antibiotic prophylaxis. The SSI rate was significantly higher in emergency surgeries as compared to the elective surgeries. The most commonly isolated organism from surgical site infections was pseudomonas (40%), followed by staphylococci (26.6%) and other bacteria.Most of the organisms which were isolated were multidrug resistant.*
Conclusion*: Regular surveillance and feedback of results to surgeons, presumably influencing surgicaltechnique.Reducing the pre-operative stay tominimum.Minimizing the length ofoperation.Avoiding wound drains. If this is not possible, using a closed drainage system and removal of drains as soon aspossible will reduce SSI.*

Keywords: *Abdominal surgery; surgical site infections.*

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I. Introduction

Surgical infections are those that occur as a result of a surgical procedure or those that require surgical intervention as part of their treatment. They are characterized by a breach of mechanical/anatomic defense mechanisms (barriers) and are associated with greater morbidity, significant mortality.[1]

However, until recently, the occurrence of infection related to the surgical wound was the rule rather than the exception. In fact, the development of modalities to effectively prevent and treat infection has occurred only within the last several decades.[2]

Advances in infection control practices include improved operating room ventilation, sterilization methods, barriers, surgical technique, and availability of antimicrobial prophylaxis. Despite these activities, SSIs remain a substantial cause of morbidity and mortality among hospitalized patients. This may be partially explained by the emergence of antimicrobial-resistant pathogens and the increased numbers of surgical patients who are elderly and/or have a wide variety of chronic, debilitating, orimmunocompromising underlying diseases. There also are increased numbers of prosthetic implant and organ transplant operations performed. Thus, to reduce the risk of SSI, a methodical but realistic approach must be applied with the awareness that this risk is influenced by characteristics of the patient, operation, personnel, and hospital.[3]

SSI can double the length of time a patient stays in hospital and thereby increase the costs of health care. The main additional costs are related to re-operation, extra nursing care and interventions, and drug treatment costs. The indirect costs, due to loss of productivity, patient dissatisfaction and litigation, and reduced quality of life, have been studied lessextensively.

Abdominal surgical site infections are among the most common complications of inpatient admissions and have serious consequences for outcomes 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. This study aimed to determine the risk factors affecting abdominal surgical site infections and their incidence at GDMCH

II. Methodology

The material for the present study was obtained from patient's undergone abdominal surgery in Department of General Surgery, GDMCH for past, from June 2020 to October 2021. Done as retrospective study by collecting data. The wounds were classified according to the wound contamination class system. Patients who had serous/non purulent discharge from the wound, pus discharge from the wound, wound with signs of inflammation edema, redness, increased local temperature, fever, >38.5, induration, tenderness and wound opened by surgeon due to collection were included in the study, whereas patient with previous abdominalsurgery, wound site previouslyinfected, Stitch abscess and granulomacases were excluded.

An elaborate study of these cases with regard to date of admission, history, clinical features of wound infection, type of surgery, emergency or elective, preoperative preparation and postoperative management is done till patient is discharged from hospital, and then followed up the patient on OPD basis for any signs of wound infection.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 sterile cotton swab and was sent to microbiology department for culture and sensitivity.

III. Results

This study included 100 abdominal surgical patients, out of which 15 were infected. So the incidence is 15%. Among our study group 80 were male and 20 were female patients. Among which 10(12.5%) among male and 5(25%) among female were having SSI. Infection is more commonly seen among 61–70-year-old patients with an incidence of43%and also among 71 to 80 and 31- to 40-year-old patients. Incidence of infection among Emergency surgery is 41%(10)whereas among Elective is 6.5%(5). In our study a total of76 cases underwent elective and 24 cases were emergency surgeries.Most of The patients were having BMI of 20.1 to 25, followed by 25 to30. Incidence of infection was more in extreme of the BMI that is 61.5% in >30 group and 23.5% in<20 group.

In our study most of the patients were anemic (31%) with infection rate of 22.5%. hypoproteinemia (20%) patients had infection rate of 25%, diabetes mellitus (20%) had infection rate of 40%. Also 91 patients had a pre of hospitalization of 1 to 5 days. But infection was more among patients who had pre op stay of 6 to 10 days 62.5%.

Table 1: INCIDENCE IN RELATION TO DIAGNOSIS

DIAGNOSIS	NO.OFCASES	INCIDENCE	PERCENTAGE
Duodenalperforation	16	7	43.5%
Acuteappendicitis	24	2	8%
Umbilicalhernia	4	0	0%
Inguinal hernia	25	1	4%
Cholelithiasis	17	0	0%
Ca colon	3	1	33.3%
Blunttraumaabdomen	4	2	50%
Penetratinginjury abdomen	4	2	50%
Incisionalhernia	3	0	0%
Total	100	15	15%

Inguinal hernia and acute/ recurrent appendicitis were the most common operations performed. Surgical site infection was more among duodenal perforation, ca colon, injury abdomen and acute appendicitis

Table 2: INCIDENCE IN RELATION TO PRE OP ANTIBIOTIC

	NO. OFCASES	**INCIDENCE**	**PERCENTAGE**
Pre op	72	11	15.2%
Per op	12	0	0
Post op only	15	4	26.6%

In our study 72 of 100 cases received pre op antibiotics, 11 cases were infected with incidence of 15.2% whereas patients who received only post op antibiotics had an infection rate of 26.6%.

Table 3: INCIDENCE IN RELATION TO TYPE OF SSI

TYPE	NO.OFCASES	INCIDENCE	PERCENTAGE
Clean	38	0	0
CleanContaminated	33	3	9%
Contaminated	12	3	25%
Dirty	17	9	53%

Out of 100 cases 38% were clean cases, 33% were clean contaminated, 12% were contaminated and 17% were dirty cases. Out of which clean cases dint had any infection, clean contaminated had incidence of 9.%, contaminated cases had 25% and dirty cases had 53%. Infection was more in dirty cases.
In our study 65% cases had operation in less than 1.5hrs with incidence of infection of 7.69%, 35% of cases had operation in 1.5 to 4 hrs with an incidence of infection of 28.5%. Incidence was more in longer duration ofsurgery.

Table 4: INCIDENCE OF ORGANISM ISOLATED

ORGANISM	NO. OF CASES	PERCENTAGE
PSEUDOMONAS	6	40%
STAPHYLOCOCCI	4	26.6%
ECOLI	3	20%
KLEBSIELLA	2	13.3%

Out of 15 infected cases 6 cases had pseudomonas infection, 4 had staphylococci, 3 had E. coli and 2 had Klebsiella infection. Pseudomonas was the most common isolated organism.Staphylococcus is commonly isolated in contaminated (50%) cases. Pseudomonas is commonly isolated among dirty (66.6%) cases. Ecoli is most commonly isolated with dirty (100%) cases. Klebsiella was associated commonly with clean contaminated (50%) cases.

Staphylococci is most sensitive for cefotaxime (75%) followed by amikacin, cephoperazone, piperacillin, ceftazidime and ciprofloxacin. Pseudomonas is most sensitive for amikacin (83.3%), followed by other antibiotics. Ecoli is most sensitive for ceftriaxone (66%) and cefotaxime (66%). Klebsiella is most sensitive for piperacillin (100%) and amikacin (100%) followed by other antibiotics. Overall amikacin (66.6%) and cefotaxime (66.6%) are the most sensitive antibiotics.Staphylococci is most resistant to doxycyclin (100%) followed by other antibiotics, pseudomonas is most resistant for piperacillin (50%) followed by other antibi otics, ecoli is most resistant for tazobactum (100%) followed by other antibiotics and Klebsiella is most resistant for cefotaxime.Over all doxycyclin (53.3%) is the most resistant antibiotic noted followed by piperacillin, ceftazidime, gentamicin and others.

IV. Discussion

The present study was conducted at General Surgery Department, GDMCH.This is a retrospective study of100 cases that have undergone abdominal surgery. The overall infection rate for a total of the 100 cases was 15%.The incidence rate in this study is well within the infection rates of2.8% 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%[4]. The rates of abdominal SSIs in male patients were 12.5% and in female patients, they were 25%. The significance of this observation is not well understood.

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 7.1% in the 21-30 age groups to 43% 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 youngerpatient[5].The high incidence of 42.8% in patients above 60 years, in our study is perhaps due to decreased immunocompetence and increased chances of co-morbid factors..

The SSI rate in elective surgeries was found to be 5.26%, which was found to increase to 45.8% in emergency cases. Our results are comparable well with the results obtained by other workers. Similar results were obtained in Mahesh C B et al, 2010[5] for elective 7.61% and for emergency21.05%. 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.

In this study both low (23.5%) and high (61.5%) BMI are associated with increased incidence of infection. Similar results were obtained in Hoer J et al study[6]. One reason being a decrease in blood circulation in fat tissues is associated with the increase in infectionrate.

Incidence among the risk factors like anemia 22.5%, hypoprotenimia 25%, diabetes mellitus 40%, UTI 25%, and RTI 55.5%. Similar results were also obtained in other studies[5]

Cause being the reduced immunocompetence, wound healing factors, hyperglycemia, and preexisting

infections.

The pre operative antibiotic prophylaxis reduced the rate of SSIs from 20% to 15.2%. The pre operative antibiotic prophylaxis could decrease post operative morbidity, shorten the hospital stay and it could also reduce the overall costs which were attributable to the infection.Seyd Mansour Razavi in 2005[7], showed that administration of prophylactic antibiotic half an hour before the operation would bring about the best results and the lowest SSI.

In this study incidence in relation to the type of surgery, clean had no infection, clean contaminated had incidence of 9%, contaminated cases had 25% and dirty cases had infection rate of 53%.LulRaka et al in 2006[8] at Kosovo Teaching Hospital had the incidence rate of SSI differed by wound classification: 3.1% for clean (n=64), 9.8% for clean-contaminated (n=143), 46.1% forContaminated (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.

The difference in the rates of SSIs between the clean and the clean 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.

Most common organism isolated in our study is pseudomonas 40%, followed by staphylococci 26.6%, E coli 20% and Klebsiella 13.3%.Similar finding are obtained in some studies like Umesh S. Kamat[9] 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.

In our study Staphylococci is most sensitive for cefotaxime (75%) followed by amikacin, cephoperazone, piperacillin, ceftaxidine and ciprofloxacin.Pseudomonas is most sensitive for amikacin (83.3%), followed by other antibiotics. E.coli is most sensitive for ceftriaxone (66%) and cefotaxime (66%). Klebsiella is most sensitive for piperacillin (100%) and amikacin (100%) followed by other antibiotics.

Overall amikacin (66.6%) and cefotaxime (66.6%) are the most sensitive antibiotics. Staphylococci is most resistant to doxycycline (100%) followed by other antibiotics, pseudomonas is most resistant for piperacillin (50%) followed by other antibiotics, ecoli is most resistant for tazobactum (100%) followed by other antibiotics and Klebsiella is most resistant for cefotaxime.Over all doxycycline (53.3%) is the most resistant antibiotic noted followed by piperacillin.Inigo JJ et al[10] had Pseudomonas species 37.5% sensitive for ceftaxidine followed by 12.5% ceftriaxone. And it was most resistant forcefotaxime.Umesh S. Kamat[9] 2008 had pseudomonas species 21.4% sensitive for cefoperazone- sulbactum combination. The proportion of bacteria resistant to all antibiotics for which tested was as high as 63.93% (39/61).

The relative frequency of different isolates also varied between different studies. Thus, it can be concluded that the organisms that cause SSIs change from place to place and from time to time in the same place. The antibiotic sensitivity testing of different isolates showed multidrug resistance by most of the isolates. The review of literature indicates that there is gradual increase in drug resistance to many antibiotics in most of the organisms which are isolated from surgical patients.

V. Conclusion:

Our study reveals that though SSIs have been widely studied since a long time, they still remain as one of the most important causes of morbidity and mortality in surgically treated patients. The steps taken to reduce SSIs are still not adequate. Proper infection control measures and a sound antibiotic policy should reduce SSIs in thefuture.

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