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Original Research Article

Surgical site infections in emergency abdominal surgeries in a tertiary care hospital of North-East India

Sufil Gogoi[1], Sajeed Ahmed[2]*, Kalyan J. Dutta[2]

[1]Department of General Surgery, Jorhat Medical College and Hospital, Jorhat, Assam, India
[2]Department of General Surgery, Assam Medical College, Dibrugarh, Assam, India

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***Correspondence:**
Dr. Sajeed Ahmed,
E-mail: sajeedfarah@hotmail.com

ABSTRACT

Background: Most of the emergency abdominal surgeries are either contaminated or dirty, they carry a higher rate of complications, aided by lack of optimization of the patient before surgery as opposed to elective surgeries. Complications related to surgical site encompasses a majority and may be aggravated by pre-existing co-morbid conditions. Seroma, hematoma, wound dehiscence, surgical site infection (SSI) are some of the major complications of surgical wounds. A prospective study was carried out in Department of General Surgery, Assam Medical College and Hospital (AMCH), Dibrugarh, Assam to find out the incidence of surgical site infection (SSI), clinical presentations and causative organisms including their antibiogram.
Methods: Total 280 patients undergoing emergency abdominal surgeries in Department of General Surgery, AMCH from June 2017 to May 2018 were included in the study. Preoperative, intraoperative and post-operative details were collected, recorded and analysed. In case of SSI, wound swab was taken for culture and sensitivity and antibiotics tailored accordingly. Regular follow-up for at least 30 days post-operatively was maintained.
Results: The incidence of SSI was 21.43%, with male: female ratio being 1.22:1. SSI was highest in the age group above 50 years; 33.33%, and with co-morbidities. SSI seen highest in class 4 wounds (55%). Commonest clinical features were erythema, tenderness, edema around the wound in superficial SSI and deep SSI. Organ space SSI was associated with fever, trachycardia and leucocytosis. The most common isolates were *Staphylococcus aereus* (55%), *Escherichia coli* (21.67%), *Pseudomonas aeruginosa* (11.67%), *Klebsiella species* (3.3%).
Conclusions: To reduce the incidence of SSI, strict adherence to antisepsis protocol specially during intraoperative and postoperative is of paramount importance in emergency surgeries.

Keywords: Surgical site infection, Emergency abdominal surgery, Antibiogram

INTRODUCTION

surgical site infection (SSI) are defined as infections occurring up to 30 days after surgery (or up to one year after surgery in patients receiving implants) and affecting either the incision or deep tissue at the operation site.[1] The centre for disease control and prevention emphasises on good patient preparation, aseptic procedure, proper surgical technique and selective antimicrobial prophylaxis to decrease SSI.

SSI continues to be a major problem associated to any operative procedure. The problem gets more complicated in case of emergency surgeries, where we have the least scope to prevent SSIs preoperatively due to urgency of surgical intervention.

Host derived factors contribute significantly to the risk of SSI, including age, obesity, malnutrition, diabetes mellitus, hypercholesterolemia, and these are not amendable to optimization before emergency surgeries and add to the increase incidence of SSI.[2]

The American College of Surgeon's wound classification system divides surgical wound into 4 classes[3]- clean/class 1: risk of SSI-1-3%, clean-contaminated/class 2: risk of SSI-5-8%, contaminated/class 3: risk of SSI- 20-25%, dirty/class 4: risk of SSI- 30-40%

Most SSIs are caused by skin flora inoculated into the incision during surgery; therefore, the most common SSI pathogens are gram-positive *cocci-staphylococcal epidermis, S. aureus* and *enterococcus spp.* For intra cavity surgery, gram-negative bacilli such as *Escherichia coli* and *Klebsiella* species are potential pathogens.[2]

This study aimed to find out the incidence of SSI, clinical presentations and causative organisms including their antibiogram.

METHODS

Study type

Hospital based prospective study.

Study place

Department of General Surgery, Assam Medical College and Hospital Dibrugarh, Assam, India.

Study period

June-2017 to May-2018.

Inclusion criteria

All postoperative patients above 12 years who underwent emergency abdominal surgeries during the mentioned period.

Exclusion criteria

Exclusion criteria were, patients undergoing other operative interventions. Patients lost to follow up for a period of one month from the date of operation. Patients refused to give consent to be included in the study.

All the patients undergoing emergency abdominal surgeries in department of General Surgery, AMCH from June 2017 to May 2018 who gave consent were included in the study. Preoperative and intraoperative details were collected retrospectively and post-operatively patients were daily examined, specially wound sites and recorded in the performa. In case of SSI, wound swabs were collected from the infected surgical site with the non-touch technique to prevent contamination and kept culture tubes and sent for gram staining and for culture and sensitivity. The culture media used were nutrient agar, enriched media, indicator media and differential media. Antibiotics sensitivity was done in nutrient agar medium by Kirbey-Bauar disk diffusion method. Antibiotics used to test sensitivity were penicillin, ceftriozone, cefotaxim, vancomycin, erythromycin, co-trimoxazole, ciprofloxacin, clindamycin, linezolid, piperacillin, tazobactum, meropenem, imepenem, ceftazidime, cefepime, aztreonam, gentamycin, amikacin, tigecycline and ceforoxim. Antibiotic protocol was followed as per the culture and sensitivity report. After discharge the patients were advised to come for checkup after two weeks or earlier depending on the condition of the wound at the time of discharge and followed up for at least 30 days post-operatively. The American College of Surgeon's wound classification system, which is adapted by CDC has been followed is the study.

Ethical approval

The study was started after the ethical approval from the institutional ethics committee (H), AMCH.

Statistical analysis

The results were presented in terms of percentage and Mean+SD. All data analysis was performed with the help of microsoft excel 2010.

RESULTS

Out of total 280 patients of emergency abdominal procedures 60 patients developed SSIs. The incidence of SSI was 21.43%. Out of 60 cases, 33 were males and 27 were females. Highest incidence of SSI was observed in patients aged 50 years or more (44.34%) and lowest rate in the group 13-19 years (Figure 1). SSI was found to be highest in class 4 wounds (55%) and lowest in class 1 (6.66%) wounds (Table 1).

Table 1: Class of wound and SSI.

Class of wound	Number	Percentage
Class 1	4	6.67
Class 2	11	18.33
Class 3	12	20.00
Class 4	33	55.00
Total	60	100.00

Figure 2 shows the clinical features of superficial, deep and organ SSI the culture of swabs from the infected wounds showed that the most common isolates were *Staphylococcus aereus* (55%), *Escherichia coli* (21.67%), *Pseudomonas aeruginosa* (11.67%), *Klebsiella species* (3.3%) (Figure 3).

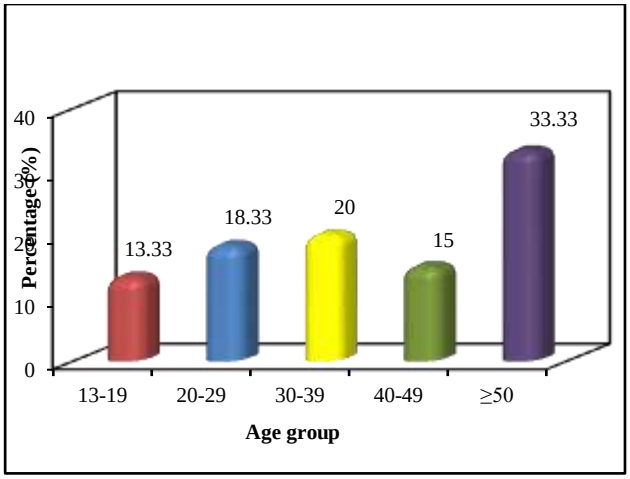

Figure 1: Age distribution of SSI.

Most of the *Staphylococcus aureus* were resistant to penicillin (90%) but sensitive to linezolid (100%) and vancomycin (100%). Resistance to cephalosporins was found to be high. In case of *Escherichia coli*, almost all isolated strains were resistant to ciprofloxacin (92.3%) and levofloxacin (77%) but all the strains were sensitive to imepenem (100%) and meropenem (100%). Intermediate sensitivity was noted with amikacin, gentamicin and cephalosporins like ceftriaxone, ceftazidime.

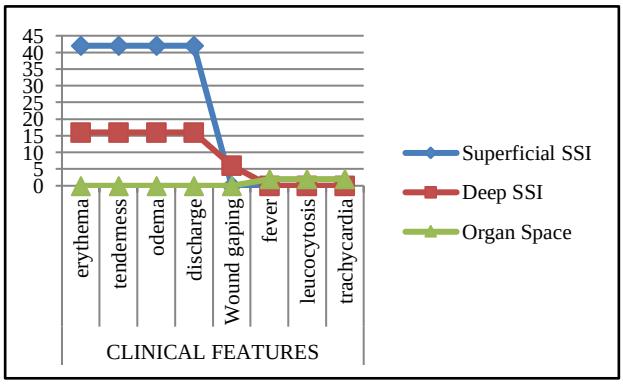

Figure 2: Clinical features in different types of SSI.

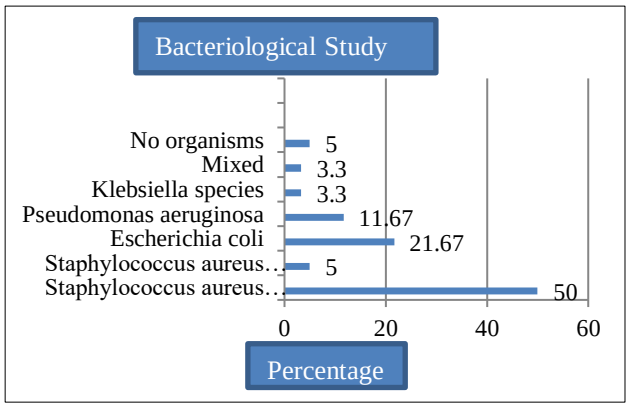

Figure 3: Causative organisms.

Pseudomonas aeruginosa showed full sensitivity to meropenem (100%) and imepenem (100%) followed by piperacillin and tazobactum (71.4%). Intermediate sensitivity to cephalosporins was observed and mostly resistant to ciprofloxacin (28.6%). Two isolates of Klebsiella strains were found in the study, in both the cases it was resistant to ciprofloxacin (100%) but it was sensitive (100%) to piperacillin, tazobactum, meropenem and imepenem.

DISCUSSION

In our study the incidence of SSI was 21.3%, 11.79% were male and 9.64% were female. In studies of Patel Sachin et al and Rajesh et al the incidence of SSI ranged from 15% to 25%.[4,5] In a study by Ansul et al 13% were male and 12% were female.[6] Highest incidence of SSI was observed in patients aged 50 years or more (44.34%) and lowest rate in the group 13-19 years and the incidence was high when associated with co-morbidities, in our study, which is similar to studies done by Narsinga Rao Bandaro et al and Keswani et al.[7,8]

Duration of operation was found to be an important risk factor in the development of SSI in this study with highest 63.33% cases where the operation lasted for>120 minutes. Haley et al also found operative time of>2 hrs as an important factor in the development of SSI.[9] We found SSI to be highest in class 4 wounds (55%) and lowest in class 1 (6.66%) wounds, which is similar to that of the study by Ortega et al.[10] In our study the most common isolates were *Staphylococcus aereus* (55%), *Escherichia coli* (21.67%), *Pseudomonas aeruginosa* (11.67%), *Klebsiella species* (3.3%), which is similar to study by Vikrant et al.[11] With regard to wound discharge, thick creamy discharge was found to be associated with *Staphylococcos* infection, bluish green in *P. aeruginosa* infection, thin muddy odourless discharge in *E. Coli* infection, yellow fishy odour discharge in *K. pneumoniae* and no organism from sero- sanguinous discharge. These findings are similar to the findings of a study carried out by Arvind et al.[12] In our study most of the *Staphylococcus aureus* were resistant to penicillin but sensitive to linezolid and vancomycin. Varsha et al and Wadekar MD et al in their studies also had similar observations.[13,14] In case of *Escherichia coli*, in our study, almost all isolated strains were resistant to ciprofloxacin (92.3%) and levofloxacin (77%) but all the strains were sensitive to imepenem (100%) and meropenem (100%). Intermediate sensitivity was noted with amikacin, gentamicin and cephalosporins like ceftriaxone, ceftazidime, whereas Wadekar MD et al found the *E. Coli* isolates were suseptable to amikacin (91%), followed by gentamycin (69.2%), meropenum (62.8%), co-trimoxazole (37.1%). *Pseudomonas aeruginosa* was found to be full sensitivity to meropenem (100%) and imepenem (100%) followed by piperacillin and tazobactum (71.4%).[14] Intermediate sensitivity to cephalosporins was observed and mostly resistant to ciprofloxacin (28.6%), in our study. Varsha et al in their study also showed 100% sensitive to

imepenum to Pseudomonas isolates. Two isolates of Klebsiella strains were found in our study, which were resistant to ciprofloxacin (100%) but it was sensitive (100%) to piperacillin, tazobactum, meropenem and imepenem.[13]

The study was limited to the department of surgery only. More information regarding the isolates and their sensitivity to the antibiotics might be gained if extended to the allied surgical departments.

CONCLUSION

SSI is a major problem in case of emergency abdominal surgeries. As the scope of prevention of SSI in preoperative period is limited in emergency surgeries, hence most of the preventive strategies must be adopted to minimize contamination of wounds during intra and post-operative period. Strict adherence to antisepsis protocol especially during intraoperative and postoperative is of paramount importance in emergency surgeries. The trend of increasing resistance of the organisms to commonly used antibiotics is a matter of concern. It necessitates continuous evaluation of organism profile and their sensitivity pattern. Judicious and rational use of antibiotics should be considered as per the prevailing antibiogram.

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