Original Research Article

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Prevalence of surgical site infections and their sensitivity patterns in elective abdominal surgeries in King George Hospital, Visakhapatnam

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ABSTRACT

Background: Surgical site infections are one of the most common complications in the postoperative period leading to increased morbidity, prolonged hospital stay and reduced quality of life. The present study aims to identify the incidence of surgical site infection (SSI), risk factors, causative organisms, and their sensitivity patterns in patients who have undergone elective abdominal surgeries.

Methods: A prospective study containing 200 patients who have undergone elective abdominal surgeries from May 2018 to January 2020 were evaluated. A thorough history was taken in all the patients. A detailed clinical examination and routine investigations were done. Parameters such as body mass index (BMI), diabetic status, type of surgery, wound grading, culture, and sensitivity patterns were considered. The patients underwent treatment based on their investigatory reports.

Results: In the present study, 54 patients developed surgical site infection, and among them, 22 are diabetics. Only ten patients with normal BMI developed SSI, whereas the other 44 patients who developed SSI had abnormal BMI. The incidence of SSI was higher in clean-contaminated surgeries comprising up to 89% of cases. Staphylococcus aureus was the most commonly isolated organism, and cefoperazone plus sulbactam was the most sensitive on antibiogram.

Conclusions: The surgical site infections are on rising trend due to the emergence of antibiotic-resistant microorganisms. Treatment of the underlying risk factors, regular wound dressings, and antibiotics, according to sensitivity patterns, are the mainstay.

Keywords: Surgical site infections, Elective abdominal surgeries, Diabetes, BMI, Antibiotics, Sensitivity

INTRODUCTION

According to centres for disease control and prevention (CDC) and the National nosocomial infections surveillance system (NNIS), surgical site infection must fall within the timeline of 30 days after a primary operation or up to 1 year if an implant is present. ^{1,2,4}

Surgical site infection is the second most common complication following a surgical procedure. They are one of the most important causes of healthcare-associated infections (HCAIs), second only to urinary tract infection (UTI) in incidence.⁴ Abdominal surgical site infection (SSI) is the most common infectious complication in hospitalized patients and is associated with severe

consequences. This study aims at determining the frequency of SSIs in patients undergoing various elective abdominal surgical procedures and associated factors, organisms implicated and their sensitivity patterns, and outcomes observed after treatment among inpatients in General Surgical wards of KGH, Visakhapatnam.

Aims and objectives

The aims and objectives were to study the incidence of Surgical site infections in King George Hospital, Visakhapatnam, to determine the risk factors for developing SSI and to identify the organisms most commonly isolated and their antibiotic sensitivity.

METHODS

In this prospective study, patients who have undergone elective abdominal surgeries in general surgery wards in Andhra Medical College, King George Hospital, Visakhapatnam From May 2018 to January 2020 were included in the study.

Sample size

The total number of patients in this study were 200. The sample size was based on the formula.

 $n=4\times p\times q/l^2$

p-prevalence: 15.5% q-100-p=84.5

1-absolute error taken as 5%.

A thorough history was taken in all the patients. A detailed clinical examination and routine investigations were done. The clinical diagnosis was made. Bowel preparation was done in the preoperative period where ever necessary. All the cases were given a dose of antibiotics (ceftriaxone) at the time of induction of anaesthesia. The wound was painted with betadine before the closure. Parameters such as BMI, diabetic status, type of surgery, wound grading, culture, and sensitivity patterns were considered. The patients were treated with broad spectrum antibiotics post-operatively for a duration of 3 days for clean surgeries, and 5 days for clean contaminated surgeries. The mean duration of surgery was <4 hours. The patients underwent treatment based on their investigatory reports.

Statistical considerations

Data was entered in Microsoft MS Excel and analysis was done in MS Excel and SPSS.

Categorical data expressed in proportions and quantitative data by means and standard deviation. Test of significance applied where ever applicable.

Inclusion criteria

All patients of >18 years of age who underwent elective abdominal surgery, including the clean, clean-contaminated, and contaminated surgeries were included in the study following informed and written consent.

Exclusion criteria

Patients who developed surgical site infections after emergency abdominal surgery and re-do surgeries, patients with collagen disorders, patients who are seropositive for HIV, HBsAg, HCV, patients who are on steroid usage for other medical illnesses, patients who underwent surgery on other organs/areas, patients who developed surgical site infections following minor surgical procedures for lesions over the abdominal wall like lipoma, sebaceous cyst, etc were excluded.

RESULTS

In the present study of 200 population, 54 cases developed SSI. Of the 200 patients, 53 are known diabetics, and among them, 22 patients (41.5%) developed SSI. By applying the Chi-square test for the null hypothesis, the p-value is 0.005516 suggesting a significant association between diabetes and SSI.

Table 1: Relation between BMI and SSI.

BMI	Number of cases	Number of cases infected
<18.5	6	6
18.5-24.9	90	10
25-29.9	84	23
>30	20	15

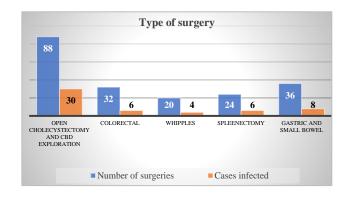


Figure 1: Surgeries and number of cases infected.

In this study, 10 patients out of 90 patients with normal BMI developed an infection. All of the 6 underweight patients developed SSI. Of the 84 obese patients, 23 developed SSI. Among 20 over obese patients, 15 developed a postoperative infection. By applying the Chisquare test for the null hypothesis, the p value is <0.00001 with Chi-square statistic of 20.9595. suggesting a significant association between BMI and SSI.

Of the above surgeries, splenectomy was considered as a clean surgery, and the others were considered as the clean-contaminated surgeries. Only 6 among the 24 clean surgeries developed SSI (11%). Among the 176 clean-contaminated surgeries, 48 have developed SSI (89%).

The wound grading was done according to two criteria i.e. Asepsis, Southampton.

According to Asepsis criteria, 38 cases were given a score of <15. 9 cases were scored between 15 and 25 and 7 cases with a score of >25.

According to Southampton criteria, 2 cases belong to grade 2a, 22 with grade 3a, 16 cases with grade 3d, 6 cases with grade 4a, and 8 cases with grade 4b.

The discharge from the wounds was cultured, and the reports obtained were as follows:

Most commonly isolated organism was *Staphylococcus* aureus (19) followed by *Escherichia coli* (16), *Klebsiella pneumoniae* (10) and *Pseudomonas* (9). All the patients were placed on empirical therapy while waiting for the report.

Once the report was obtained, the patients were treated with antibiotics according to their sensitivity patterns for 5 days, and daily dressings with betadine and normal saline were done. The sutures were removed to drain the collection wherever needed. The majority of them were sensitive to cefoperazone plus sulbactam (16) followed by ceftriaxone (12), ciprofloxacin (11), piperacillin and tazobactam (10), and meropenem (5).

DISCUSSION

Postoperative wound infections are the most common causes of morbidity and the most common nosocomial infection in surgically treated patients.

Table 2: Comparison of incidence of SSI in present study with other studies on similar subject.

Study	Incidence of SSI (%)
Present study	27
Setty et al ¹	21.66
Mukagendaneza et al ²	10.2
Awoke et al ⁴	13

The incidence of infection postoperatively changes from hospital to hospital. In the present study, the impact of SSI is 27%. In a similar survey carried out in Mysore by Setty et al, the incidence rate was 21.66%. Out of 200 patients, 54 patients developed surgical site infections. Of these 54 patients, 22 patients had diabetes (40%), indicating diabetes as one of the critical risk factors for developing a postoperative infection. In the study carried out by Setty et al. The incidence of SSI in diabetics was

observed to be 83.3%.¹ In research carried out by Awoke et al., prevalence of infection in people with diabetes was 3.1%.⁴ It is observed that the administration of preoperative prophylactic antibiotics decreases the risk of SSI postoperatively.

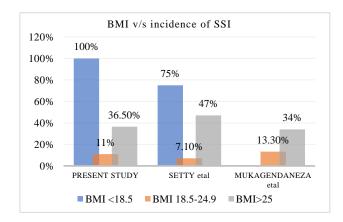


Figure 2: Relation between SSI and BMI in various studies.

The incidence was also increased in clean-contaminated surgeries (88.8%) than in clean surgeries (11.1%), showing the type of surgery as an important determinant in the risk of developing a postoperative infection. In the study carried out by Curcio et al, the prevalence of SSI in clean and clean-contaminated surgeries was 15%.³ In a study by Kumar et al, the incidence of SSI in clean surgeries was 14.6% and 29.2% in clean-contaminated surgeries.⁶

The majority of the patients had normal BMI (90 patients), and among them, 11% developed SSI. An increase in incidence was seen in patients with BMI <18.5 and >25 (110 patients), contributing to 40%, suggesting that malnutrition and obesity as important indicators for the development of SSI. According to Setty et al, the infection rate was 7.1% in normal BMI patients and 75% in underweight and 47% in overweight patients. ¹

The most commonly isolated organisms from the culture were *S. aureus* and *Escherichia coli* contributing to 64.8%, followed by *Klebsiella pneumonia* 18.5% and *Pseudomonas* 16.6. In a study by Mukagendaneza et al, the most common isolated organism was *Klebsiella* (55%), whereas, in a survey by Setty et al, it was *S. aureus*. ^{1,2} In a study by Kumar et al, the most commonly isolated organism was *E. coli* (22.9%). ⁶

In most cases, the organism isolated was sensitive to cefoperazone followed by, Ceftriaxone, ciprofloxacin, piperacillin, and meropenem. But in the study carried out by Mukagendaneza et al, imipenem and amikacin were the most effective antibiotics.² In a study by Setty et al, the isolated organisms were found sensitive to ciprofloxacin.¹

CONCLUSION

The surgical site infections increase the post-op morbidity by increasing the period of stay in the hospital, expenses, and reduce the quality of life. The incidence of SSI was higher in patients who are malnourished, diabetic, obese and have undergone contaminated surgeries. Most commonly isolated organism in this study is *S. aureus* and the most sensitive antibiotic is cefoperazone and sulbactam.

Limitations

The study will be done in a limited number of subjects, because the study subjects will be selected by convenience sampling. The results may vary if done in a large number of subjects and immuno-compromised patients.

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Ethical approval: The study was approved by the

Institutional Ethics Committee

REFERENCES

- Setty NK, Nagaraja M, Nagappa D, Naik L, Giriyaiah C, Gowda N. A study on Surgical Site Infections (SSI) and associated factors in a government tertiary care teaching hospital in Mysore, Karnataka. Int J Med Public Health, 2014;4(2):171.
- Mukagendaneza, MJ, Munyaneza E, Muhawenayo, E, Nyirasebura D, Abahuje E, Nyirigira J, et al. Incidence, root causes, and outcomes of surgical site infections in a tertiary care hospital in Rwanda: a prospective observational cohort study. Patient Saf Surg. 2019;13:10.
- 3. Curcio D, Cane A, Fernández F, Correa J. Surgical site infection in elective clean and clean-contaminated surgeries in developing countries. Int J Infect Dis. 2019;80:34-45.

- Awoke N, Arba A, Girma A. Magnitude of surgical site infection and its associated factors among patients who underwent a surgical procedure at Wolaita Sodo University Teaching and Referral Hospital, South Ethiopia. PLOS One. 2019;14(12):e0226140.
- Purba AKR, Setiawan D, Bathoorn E, Postma MJ, Dik JWH, Friedrich AW. Prevention of Surgical Site Infections: A Systematic Review of Cost Analyses in the Use of Prophylactic Antibiotics. Frontiers in Pharmacol. 2018;9:776.
- Kumar TVR, Goud KA. A study of surgical site infections in a general practice hospital. Int Surg J. 2019;6(11):4043-7.
- Watanabe A, Kohnoe S, Shimabukuro R, Yamanaka T, Iso Y, Baba H, et al. Risk factors associated with surgical site infection in upper and lower gastrointestinal surgery. Surg Today. 2008;38:404-12.
- 8. Azoury S, Farrow N, Hu Q, Soares K, Hicks C, Azar F, et al. Postoperative abdominal wound infection epidemiology, risk factors, identification, and management. Chron Wound Care Manage Res. 2015;2:137-48.
- Astagneau P, Rioux C, Golliot F, Brücker G. Morbidity and mortality associated with surgical site infections: results from the 1997-1999 INCISO surveillance. J Hospital Infect. 2001;48:267-74.
- 10. Alkaaki A, Al-Radi O, Khoja A, Alnawawi A, Maghrabi A, Altaf A, et al. Surgical site infection following abdominal surgery: a prospective cohort study. Can J Surg. 2019;62(2):162-8.

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