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General Surgery

SURGICAL SITE INFECTIONS AT A TERTIARY CARE CENTRE: A CROSS SECTIONAL STUDY

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ABSTRACT **Background:** Surgical site infections are associated with substantial morbidity and mortality, increase in hospital stay and enhanced cost of health care. Objective of present study is to identify the etiological pathogens and their antimicrobial susceptibility, resistance and risk factors for development SSIs.

Methods: It is observational study carried out at Department of General Surgery at GSVM Medical College, Kanpur, India for a period of one year. It is a tertiary care centre and a teaching hospital. A predesigned and pretested proforma was used to collect data. Surgical sites were examined and culture with sensitivity was done for infected wounds.

Results: The most commonly isolated bacteria were: Klebsiella, E. coli and Staphylococcus aureus. Increasing age and associated diabetes showed significantly higher rates of infection compared to their counterparts. Universal resistance was present to ampicillin, cefoxitin, ceftriaxone and tetracycline, while organism were sensitive to Imipenam, Meropenam and Piperacillin.

Conclusions: Post-operative abdominal wound infection represents a substantial burden of disease both for the patients and the healthcare services in terms of the morbidity, mortality and economic costs.

KEYWORDS : Surgical site infection, Culture with sensitivity

BACKGROUND

Infection of the surgical site (formerly referred to as "wound infection", terminology that is no longer used owing to confusion between infections of surgical incisions and those of traumatic wounds) is a consequence of surgery, but it is not inevitable.

Surgical site infection (SSI) refers to infections that take place within 30 days of an operative procedure and may extend to more than 30 days according to the surgical procedure [1]. One of the common problems in a hospital setting, reports from the World Health Organization in 2009, 23% of surgical patients worldwide developed SSIs [2].

SSI is the index of the health care system of any hospital. With the increase in incidence of nosocomial infections and multi drug resistance, a meticulous and periodic surveillance of various hospital acquired infections is called for.

The impact of healthcare-associated infection is multifactorial, including prolonged hospital stays, long-term disabilities, increased resistance of microorganisms to antimicrobials, high health system costs, emotional stress for patients and their families, and substantial economic burdens for hospitals. SSIs and hospital stays can lead to pressure ulcers, hypoglycemia, additional economic burden, and death [3,4].

The aim of the study was to establish the burden of SSI, its risk factors, the etiological bacterial agents associated with SSI and their antimicrobial susceptibility pattern.

MATERIALS AND METHODS

This study was a cross sectional observational study conducted in DEPARTMENT OF GENERAL SURGERY, in a tertiary care hospital. Elective and emergency general surgical cases who developed surgical site infections were taken up for study. Surgeries on severely immunocompromised patients, patients with incomplete primary closure of the wounds and re-look surgeries were excluded from the study.

A total of 112 patients were observed in this study, out of which 66 were emergency cases and 46 were elective cases fulfilling our study criteria.

All patients received pre-operative antibiotic injection of ceftriaxone along with metronidazole one hour before surgery. An elaborate study of these cases with regard to date of admission, history, clinical features, type of surgery, emergency or elective, preoperative preparation, procedure done, postoperative management and post-operative findings which included day of 1st dressing and frequency of change of dressing, day of wound infection, signs of wound infection were noted which included fever, erythema, discharge, type and colour of the exudates till patient is discharged from hospital, and then followed up the patient for 6 weeks on OPD basis for any signs of wound infection.

Specimen collection and processing

Post-surgical wound swabs or pus aspirates were collected from the clinical infected surgical sites following laboratory standard procedure for specimen collection. Briefly, the surrounding area of the surgical wound was cleaned with 70% ethyl alcohol and excess debris from the wound base removed by irrigating with normal saline before collection of two sterile cotton swabs. Swabs were immediately sent to the microbiology laboratory for analysis, to avoid desiccation and to prevent the growth of some species at room temperature that may obliterate the true pathogens.

After the arrival of the specimen at the microbiology laboratory, swabs or aspirates were inoculated on Mac Conkey and 5% Sheep Blood agar (BA) by rolling the swab over the agar and streaking from the primary inoculums, and aerobically incubated overnight at 37□ °C for 24–48□ h. The antibiotic susceptibility was performed using the standard disc diffusion method. After reading the zone diameters, the bacteria were classified as sensitive, intermediate or resistance. Laboratory data (including gram stain, culture results, and identification of the bacterial isolates as well as antimicrobial susceptibility) were recorded on a data sheet. Quality control was performed using test strains of *E. coli* ATCC 25 922, *Staphylococcus aureus* ATCC 25923, and *Pseudomonas aeruginosa* ATCC 27853.

RESULT

Table 1: Age distribution:

Age in years	No. of elective cases with SSI	percentage	No of emergency cases with SSI	Percentage
<18 years	2	4.34	5	7.57
18-30 years	12	26.08	13	19.70
31-50 years	13	28.26	22	33.34
>50 years	19	41.30	26	39.40

The age of study subjects ranged between 18 to 62 years. Majority of them belonged to middle age group (31-50), whereas 40.17% of cases were above 50 years of age.

Table 2: Co-morbidity and SSI

Co-morbidity	No of elective cases	Percentage	No of emergency cases	Percentage
Diabetes Mellitus	6	13.04	15	22.72
Hypo-albuminemia	5	10.86	9	7.57
Anaemia	3	6.52	13	19.69

Diabetes mellitus is the foremost co-morbid condition associated with SSI. In our study 13.04% elective cases and 22.72% emergency cases were diabetic. While 10.86% elective cases and 7.57% of emergency cases were having hypo-albuminemia suggestive of malnutrition & 6.52% elective cases and 19.69% of emergency cases were anaemic.

Table 3: Organism isolated from SSI wounds:

Type of organism	No of elective cases	Percentage	No of emergency cases	Percentage
Klebsiella	9	19.56	28	42.40
Staphylocoocus aureus	17	39.95	20	30.33
Acitenobacter	2	4.34		
E.coli	12	26.08	10	15.16
Proteus			2	3.03
Pseudomonas	4	8.69	6	9.09

Among the elective surgical wounds, Staphylococcus aureus is the most common organism (39.95%) isolated in culture followed by E.coli (26.08%) and klebsiella (19.56), while Klebsiella is most common organism (42.40%) causing SSI in emergency surgical wounds.

An interesting finding in our study is the infrequency of isolation of *Acinetobacter* species, an organism commonly isolated in Intensive Care Units. This may be explained by the small number of cases from the surgical intensive care in our study.

Table 4: Antibiogram:

Antibiotics	No of resistant SSI*	Percentage
Ampicillin	108	93.10
Cefoxitin	96	82.75
Ceftriaxone	90	77.58
Tetracycline	89	76.72
Cefoperazone sulbactum	64	55.17
Amikacin	53	45.68
Netilmycin	48	41.37
Ciprofloxacin	40	34.48

*Some organism are resistant to more than one antibiotic.

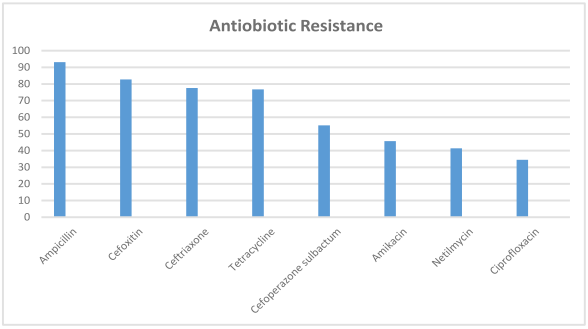

Figure: 1

As it is demonstrated in Figure 1, antibiotic sensitivity profiles were reported for the organisms isolated from surgical incision sited in patients with SSI. The pathogens showed very high resistance toward ampicillin (93%), Cefoxitin (82.75%), Ceftriaxone (77.58%) and Tetracycline (76.72%).

DISCUSSION

Post-operative wound infection still remains one of the most important causes of morbidity and is most common nosocomial infection in surgically treated patients [5,6].

The current study was conducted on the patients who developed surgical site infection. In current study a higher proportion of SSI was found among elderly age group (>50 years) [table 1]. This is comparable to other studies [7-10]. The rate of SSI increases with age. This is due to poor immune response, poor protein and nutrients reserve, existing co-morbid conditions in old patients and reduced compliance with treatment.

In the present study a significant proportion of males developed SSI compared to females. In another study in Pune, there was a marginal preponderance of male patients developing SSI (7.4%) over female patients with SSI (5.1%) [11]. In Aligarh, females (27%) showed preponderance of SSI than males (18%). [12] However according to Berard F and Gandon J sex is not a pre determinant of the risk of SSI. [13]

In current study, diabetes was present in 21 cases (18.10%), malnutrition in 9 cases (7.75%) and anaemia in 16 cases (13.79%). In a retrospective study of risk factors in 15 cases of postsurgical wound infection by John et al in Messologi, malnutrition was noticed in 5 cases (33.33%), anaemia in 6 cases (40%), diabetes in 6 cases (40%).[14] Waqar et al from Pakistan institute of medical sciences studied 117 cases from 1st January 2002-31st Dec 2002, out of which obesity was found in 13%, anaemia was found in 17% cases, undernutrition in 13% cases.[15]

In current study, members of enterobacteriaceae family (Klebsiella-42.40% and E.coli 15.16%) were predominant isolate in emergency cases, while Staphylococcus aureus (39.95%) was predominant isolate in Elective cases. However, the results of this study agree with the findings of other studies, in which, *Klebsiella ssp* was found to be the predominant bacteria isolated [16]. Staphylococcus aureus is found in normal flora of skin, hence it is a common cause of SSI.

In our study high resistance rates to commonly used antibiotic, ranging from 34.48% to 93.10%, were observed in bacterial isolates causing SSI. Not surprising, 77.58% of SSI showed resistance to ceftriaxone, which was prescribed as prophylaxis to all who undergoes surgery. The isolates showed maximum sensitivity to Imipenem, Meropenem, Amoxycillin with clavulanic acid and Piperacillin.

The presence of multidrug resistant bacteria isolated in SSI has also been described in other studies in developing countries. This remarkably higher resistance may be due to their easily availability and inappropriate use of the drugs in our hospitals.

CONCLUSION

Staphlococcus is the commonest organism isolated from elective surgical wounds and Klebsiella is the commonest organism isolated from emergency surgical wounds. Overall Imipenam, Meropenam, Piperacillin and Amoxicillin with Clavulonic acid are sensitive drugs for SSI's developed in our centre. Hence, change in the preoperative antibiotics may reduce the incidence even lower. A pre-existing conditions like diabetes mellitus, malnutrition and anaemia predispose to surgical site infection which has to be taken care of.

Limitations of the study

High risk factors for SSI like smoking and increased BMI were not taken into account. Regarding the bacteria, anaerobic bacteria was not cultured. Only those cultures which were positive for aerobic bacteria included in this study

REFERENCES:

1. Heather L. O., David H. K., Louise F. L., Janet L. K., Deirdre O.D., Susie J., et al. Foundations of Best Practice for Skin and Wound Management: Best Practice Recommendations for The Prevention and Management of Wounds. 2018.
2. World Health Organization (WHO). First Global Patient Safety Challenge Clean Care is Safer Care. 2009.
3. Suzanne M. Pear. Patient Risk Factors and Best Practices for Surgical Site Infection Prevention. 2007.
4. Bello Famakinwa TT, Oyeniran B.G., Okhiah YA, Nwadike R.N. Knowledge and practice of post-operative wound infection prevention Among nurses in the surgical unit of teaching hospital in Nigeria. IJBAIR. 2014;3(1):23–8
5. Suljagić V, Jevtic M, Djordjevic B, Jovelic A. Surgical site infections in a tertiary health care center: Prospective cohort study. Surg Today 2010;40:763-71.
6. Desa LA, Sathe MJ. Factors infl uencing wound infection (a prospective study of 280 cases). JPostgrad Med1984;30:231-6
7. Reichman DE, Greenberg JA. Reducing Surgical Site Infections: A Review. Rev ObstetGynecol 2009;2:212-21. 5.
8. Anvikar AR, Deshmukh AB, Karyakarte RP, Damle AS, Patwardhan NS, Malik AK, et al. A one year prospective study of 3280 surgical wounds. Indian J Med Microbiol1999;17:129-32.
9. Patel SM, Patel MH, Patel SD, Soni ST, Kinariwala DM, Vegad MM. Surgical site infections: Incidence and risk factors in a tertiary care hospital, Western India. Natl JCommunity Med 2012;3:193-6.
10. Ma ngram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for prevention

of surgical site infection, 1999. Hospital Infection Control Practices Advisory Committee. Infect Control Hosp Epidemiol 1999 20:250-78.
11. Varsha S, Saikat B, Upendra L. Surgical site infections: A one year prospective study in a tertiary care center. Int J Health Sci (Qassim) 2012;6:79-84.
12. Khan MA, Ansari MN, Bano S. Post operative wound infection. Indian JSurg1985;48:383-6.
13. Berard F, Gandon J. Factors infl uencing the incidence of wound infection. Ann Surg 1964;160:32-81.
14. John S. Wound dehiscence: is still a problem in the 21th century: a retrospective study. World Journal of Emergency Surgery 2009; 4:12 doi:10.1186/1749 7922-4-12
15. Waqar Study of wound infection in Pakistan institute of medical sciences. Ulus trauma, 2001; 7(2):96-9.
16. Lubega A, Joel B, Justina LN. Incidence and etiology of surgical site infections among emergency postoperative patients in Mbarara regional referral hospital. South Western Uganda Surg Res Pract. 2017;2017.