Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

Study of Clinical Profile of Patients with Surgical Site Infections in Operated Cases of Perforation Peritonitis

Kapil Rampal[1], Parampreet Singh Sandhu[2], Garima Mal[3], Pargat Singh[4], Meghna Sharma[5*], Sudhir Khichy[6],

[1]Associate Professor, Department of Surgery, GGSMCH, Faridkot Punjab, India,
Email: balkarankapil@gmail.com
Orcid ID: 0000-0003-3533-8805
[2]Assistant Professor, Department of Surgery, GGSMCH, Faridkot Punjab, India,
Email: param18192@gmail.com
Orcid ID: 0000-0002-0035-2845
[3]Senior Resident, Department of Surgery, GGSMCH, Faridkot Punjab, India,
Email: garimamal21@gmail.com
Orcid ID: 0009-0006-2371-6935
[4]Resident, Department of Surgery, GGSMCH, Faridkot Punjab, India,
Email: Pargatshanu131@gmail.com,
Orcid ID: 0009-0000-9643-6391
[*5]Microbiology Medical officer, GGSMCH, Faridkot Punjab, India,
Email: smeghna2012@gmail.com
Orcid ID: 0000-0002-8134-6008
[6]Professor, Department of Surgery, GGSMCH, Faridkot Punjab, India,
Email: skhichy@rediffmail.com
Orcid ID: 0009-0004-5513-6711

*Corresponding author

Received: 25 November 2023
Revised: 12 January 2024
Accepted: 30 January 2024
Published: 29 February 2024

Abstract

Background: Surgical site infections (SSIs) are defined as infections occurring till 30 days after surgery (till one year after surgery in patients having implants) and involving the incision or deep tissue at the surgical site. SSIs are an important clinical issue and contribute to both post operative mortality and morbidity. The incidence of SSIs has been reported to be high as 20%. **Material & Methods:** It is a retrospective observational study conducted in our surgical unit of a tertiary care centre. A total of 520 patient records were analyzed. Out of these 98 patients were found to have SSI and were included in the study. **Results:** SSI patients presented with various clinical attributes. Discharge from the wound was present in 100% patients out of which 51% patients had discharge from infra umbilical area and 36.7% had discharge from only supra umbilical area. Fever was present in 28.6% of patients and pain was present in 33.7% patients 30% patients had history of alcohol intake and 22.4% had history of intravenous drug abuse. 46.9% patients of SSI had small intestine as the site of perforation and 40.9% had stomach and duodenum as the site of perforation.67.3% patients had BMI above 30kg/m2. 75.5% patients were from lower socioeconomic status(as per modified Kuppuswamy scale 2021). 56% patients were female and 44% were male. 55% patients were from urban areas whereas 45% were from rural background 28.6% patients were less than 30years of age and 22.4% were above 60 years of age. **Conclusions:** Many of the risk factors for SSI are modifiable and a concerted effort by the patient and physician surgeon can improve outcomes.

Keywords:- SSIs, Surgery, Perforation Peritonitis.

INTRODUCTION

Surgical site infections (SSIs) are defined as infections occurring till 30 days after surgery (till one year after surgery in patients having implants) and involving the incision or deep tissue at the surgical site. SSIs are an important clinical issue and contribute to both post operative mortality and morbidity. The incidence of SSIs has been reported to be high as 20%, depending on the surgical procedure and the study criterion used.[1] The pathogens for SSIs may initiate from the patient's endogenous flora or be acquired from

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

environment. The most commonly isolated organisms are Staphylococcus aureus, coagulase-negative staphylococci, Enterococcus species. and Escherichia coli. Multiple patient, procedure, environmental and agent related factors impact the risk of SSI. N Prevention hence requires a 'bundle' approach, with systematic approach to agent, host and environmental factors. The Centers for Disease Control and Prevention guidelines for the prevention of SSIs emphasize upon the good patient preparation, aseptic practice, flawless surgical technique and antimicrobial prophylaxis.[2] Available literature favors using newer technologies like microbial sealants, that halt skin flora during the surgery.[1]

The CDC definition describes three levels of SSI:

- Superficial incisional: affecting the skin and subcutaneous tissue. These manifest by localised (Celsian) signs like redness, pain, heat or swelling at the site of the insicion or by the drainage of pus.
- Deep incisional: affecting the fascial and muscle layers. These manifest by the presence of pus or an abcess, systemic features like fever with tenderness of the wound, or a separation of the edges of the incision exposing the deeper tissues.
- Organ or space infection: which involves any part of the anatomy other than the incision made during the surgical procedure. These infections may manifest by the drainage of pus or the formation of an abscess detected by histopathological or radiological examination or during re-operation.[2]

Risk of SSI is affected by multiples patient and procedure specific features, active antibiotic prophylaxis and skin preparation are important components of the systematic approach to SSI prevention. Antibiotic prophylaxis should use an appropriate drug and dosage to limit adverse effects and drug resistance in bacteria. Suitable preoperative skin preparation is vital to decrease the number of probable wound contaminants.[3]

We studied clinical profile of patients with surgical site infections in post laparotomy perforation peritonitis patients and observed risk factors associated with the condition.

MATERIAL AND METHODS

It is a retrospective observational study conducted in our surgical unit of a tertiary care centre, Guru Gobind Singh Medical College and Hospital, Faridkot, India with ethical compliance. Case records, from January 2017 to December 2022, were observed for age, gender, occupation, socioeconomic status, body mass index (BMI) clinical features, radiological findings (intra abdominal collections, anastomotic complications). A total of 520 patient records were analyzed. Out of these 98 patients were found to have SSI and were included in the study. The demographic characteristics include age, sex, and socioeconomic status. Non-clinical risk factor includes parity, obesity, nutritional status, substance abuse, use of immune-supressor drugs and steroids. Use of vegetarian diet and non vegetarian diet was included in dietary habit.

Clinical profile included performance status, presenting symptoms, duration of symptoms,

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

presence of anaemia, site of disease, and features of sepsis, deranged laboratory parameters. Interview technique was used to collect the information about demographic characteristics, nonclinical characteristics, and dietary habit. Socioeconomic status was determined as per the modified Kuppuswamy's socioeconomic scale 2021.

Inclusion Criteria

All consenting adult patients who underwent laparotomy for perforation peritonitis were included. Included patients had abdominal closure with common technique and suture material as per file records.

Exclusion Criteria

Patients with age below 18 years, non consenting individuals, patients on who left hospital against medical advice or patients who could not be contacted were excluded.

All patients were managed according to the local protocol for treatment of SSIs . In our institute, cases of SSIs are managed with third generation cephalosporines, aminoglycosides and metronidazole. The antibiotics were further adjusted according to disease progression and availability of antibiotic sensitivity reports. Descriptive variables were represented using mean for continuous data and frequency (%) for categorized data.

RESULTS

28.6% patients were less than 30years of age and 22.4% were above 60 years of age. [Table 1]

56% patients were female and 44% were male. [Table 2]

55% patients were from urban areas whereas 45% were from rural background. [Table 3]

75.5% patients were from lower socioeconomic status(as per modified Kuppuswamy scale 2021). [Table 4]

67.3% patients had BMI above 30kg/m2. [Table 5]

30% patients had history of alcohol intake and 22.4% had history of intravenous drug abuse. [Table 6]

46.9% patients of SSI had small intestine as the site of perforation and 40.9% had stomach and duodenum as the site of perforation. [Table 7]

SSI patients presented with various clinical attributes. Discharge from the wound was present in 100% patients out of which 51% patients had discharge from infra umbilical area and 36.7% had discharge from supra umbilical area.

Fever was present in 28.6% of patients and pain was present in 33.7% patients. [Table 8]

Incisional hernia was seen in only 14.3% of patients after 6 months of follow up. [Table 9]

65% patients had hemoglobin levels of <10 gm/dl.88% patients had increased TLC count.22.4% patients had raised total bilirubin, 44.9% had raised liver enzymes and 34.7% had raised ALP. Low serum albumin below 3.5gm/dl was present in 62.2 % patients.

Deranged renal function was present in 55% of patients.CRP was raised in 89.8% of patients.

On presentation in 34.7% patients were acidotic, 32.7% patients were on ionotropic

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

support and 12% patients were on ventilatory support.

Mean hospital stay was 14 days. In non SSI post laprotomy patients mean hospital stay was 8 days. [Table 10]

Diabetes Mellitus was present in 48.9% patients,24.5% patients suffered from HIV and 32.7% patients had other comorbidities like malignancy, connective tissue disease and Coronary artery disease. [Table 11]

Gram positive flora was cultured in 24.5% patients whereas gram negative flora was present in 71.2% patients. [Table 12]

Out of 98 patients 4 pateints died due to SSI. [Table 13]

48.9% patients underwent re-suturing, 20.4% patients needed surgical debridement and 16.3% patients underwent repair of the burst abdomen. [Table 14]

Table 1: Age distribution

Attribute		**Frequency**	**Percentage**
Age in years	< 18	Nil	Nil
	18-30	28	28.6
	31-40	14	14.3
	41-50	18	18.4
	51-60	16	16.3
	>60	22	22.4

Table 2: gender distribution

		Frequency	**Percentage**
Gender	Male	43	44
	Female	55	56

Table 3: residential attributes

		Frequency	**Percentage**
Residence	Urban	54	55.1
	Rural	44	44.1

Table 4: socio economical attributes

		Frequency	**Percentage**
Socioeconomic status	Upper	Nil	Nil
	Middle	24	24.5
	lower	74	75.5

Table 5: obesity distribution

		Frequency	**Percentage**
Body mass index BMI	<30 kg/m^2	32	32.7
	>30 kg/m^2	66	67.3

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

Alcohol		30	30.6
Intravenous drug abuse		22	22.4
Immuno suppressant drugs		18	18.4

Table 6: substance abuse

Table 7: site distribution of perforation

		Frequency	**Percentage**
Site of perforation	Stomach and duodenum	40	40.9
	Small intestine	46	46.9
	colorectal	12	12.2

Table 8: clinical features

		Frequency	**Percentage**
Clinical manifestations post surgery			
Fever		28	28.6
Pain		33	33.7
Systemic symptoms		32	32.6
Discharge from wound	Infra umbilical portion	50	51.0
	Supra umbilical portion	36	36.7
	Whole length	12	12.2
Burst abdomen		16	16.3

Table 9: incisional hernia at 06 month follow up

		Frequency	**Percentage**
Incisional hernia after 6 months	Yes	14	14.3
	No	84	85.7

Table 10: laboratory parameters

Laboratory parameters			
Haemoglobin	< 10 gm/dl	64	65
	>10 gm/dl	34	35
Leucocytosis (cells > 11000/mm3)		88	
Liver function Tests			
Raised bilirubin(> 17µmol/L)		22	22.4
Raised transferase enzymes(> 60 units /L)		44	44.9
Raised alkaline phosphates(> 150 units/L)		34	34.7
Low serum albumin(< 35 gm / L)		61	62.2
Renal function tests	Blood urea >20 mg/dl	54	55.1
	Serum creatinine >1.5 mg/dl	58	59.1

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

International normalized ratio	>1	68	69.4
C Reactive proteins	> 4mg/dl	88	89.8
Acidosis on presentation		32	32.7
Ionotropic support on presentation		34	34.7
Ventilator requirement on presentation		12	12.2
Onset to hospital time (days)		07	7.1
Mean Hospital stay till discharge		14	

Table 11: co morbidities

	Frequency	**Percentage**
Co morbidities		
Diabetes mellitus	48	48.9
Hypertension	34	34.7
Respiratory disorders	18	18.4
Human immuno deficiency virus positive status	24	24.5
Others like malignancy, connective tissue disorders and coronary artery disease	32	32.7

Table 12: bacterial profile

		Frequency	**Percentage**
Microbiology	Gram positive	24	24.5
	Gram negative	70	71.2
	Polymicrobial	4	4.1

Table 13: mortality

Mortality	Total	4	4.1

Table14: surgical interventions required

Requirement for surgery	Debridement	20	20.4
	Re suturing	48	48.9
	Repair of burst abdomen	16	16.3

DISCUSSION

Wound infection can be defined as the invasion of organisms through tissues following a breakdown of local and systemic host defenses, leading to cellulitis, lymphangitis, abscess, and bacteremia. Infections of surgical wounds are called surgical site infections (SSIs).[4] SSIs are defined as infections occurring within 30 days after surgery or within one year if an implant is left in place after the procedure and affects either the incision or deep tissue at the operation site.[2,5] According to the National Nosocomial Infection Surveillance Program (NNIS), it is classified into superficial, deep, and organ/space infections.[6]

Sources of SSIs include the patient's own normal flora, organisms present in the hospital environment that are introduced into the patient by medical procedures, specific

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

underlying diseases, trauma, or burns that may cause a mucosal or skin surface interruption.[7] Many studies have reported that SSI ranks third among common nosocomial infections, next to the urinary tract and respiratory tract infections.[5,8]

Studies have reported that global SSI rate ranges from 19.4% to 36.5%, whereas these range from 3% to 12% in India.[9,10,11] 98 patients out of 520 patients included in our study had postoperative wound infections. The overall prevalence rate of SSIs was 18%. This is in coherence with global rates but higher than the rates observed by Kumar et al. and Al-Mulhim et al,[11,12] who reported in their study that the overall prevalence rate of SSIs was 2.5%.

The occurrence of SSIs in the present study was more in females (56%) when compared to males (44%). A study by Hernandez et al. in 2005 conducted in a Peruvian Hospital reported more occurrences among males (65.6%).[13] Study done by Shanmugam et al. reported almost equal occurrences among females (52%) and males (48%).[14]

In our study 75.5% patients were from lower socioeconomic status (as per modified Kuppuswamy scale 2021).This may be attributed to the poor nutritional status and hypoalbuminemia seen in 62.2% patients.

A BMI of >30 is associated with increased likelihood of developing a SSI, and this relationship strengthens with increasing BMI.[15] In our study 67.3% patients had BMI above 30kg/m2. Similar results were reported by Lawson EH.[16]

Drapeau et al reported two folds higher rate of SSI in HIV- infected patients when compared to the general population.[17] In our study 24.5% patients had HIV positive status and all these patients had low CD4 count. In our study all HIV patients developed SSI.

In the present study it was observed that gram negative organisms were isolated in 71.9% of the patients of SSI. Similar trend was observed by V. Negi et al.[18]

Average hospital stay was 14 days that is longer than 08 days hospital stay observed in non SSI cases. This implicates the increased burden on the health care system imposed by the SSIs. Patients were managed with broad spectrum antibiotics and antibiotic dessings and suitable surgical interventions. Antibiotics were narrowed down depending upon the sensitivity of the organisms cultured from the wound. 48.9% patients underwent re-suturing, 20.4% patients needed surgical debridement and 16.3% patients underwent repair of the burst abdomen.14.3% of the patients developed incisional hernias as the late complication of the SSIs.

CONCLUSIONS

SSIs complicate the recovery course of a significant proportion of general abdominal surgical patients and are associated with excessive health care costs. SSIs increase postoperative mor- bidity and mortality, and may require hospital admission, intravenous antibiotics, and even surgical reintervention. Risks associated with SSIs are both related to host and perioperative factors. However, many of these are modifiable and a concerted effort

Annals of International Medical and Dental Research
E-ISSN: 2395-2822 | P-ISSN: 2395-2814
Vol-10, Issue-2 | March-April 2024
https://doi.org/10.53339/aimdr.2024.10.2.11
Page no- 81-88 | Section- Research Article (Surgery)

by the patient and physician surgeon to make changes can improve outcomes.

REFERENCES

1. Owens CD, Stoessel K. Surgical site infections: epidemiology, microbiology and prevention. J Hosp Infect. 2008;70 Suppl 2:3-10. doi: 10.1016/S0195-6701(08)60017-1.
2. Horan TC, Gaynes RP, Martone WJ, Jarvis WR, Emori TG. CDC definitions of nosocomial surgical site infections, 1992: a modification of CDC definitions of surgical wound infections. Infect Control Hosp Epidemiol. 1992;13(10):606-8.
3. Dohmen PM. Antibiotic resistance in common pathogens reinforces the need to minimise surgical site infections. J Hosp Infect. 2008;70 Suppl 2:15-20. doi: 10.1016/S0195-6701(08)60019-5.
4. Smyth ET, Emmerson AM. Surgical site infection surveillance. J Hosp Infect. 2000;45(3):173-84. doi: 10.1053/jhin.2000.0736.
5. Mangram AJ, Horan TC, Pearson ML, Silver LC, Jarvis WR. Guideline for Prevention of Surgical Site Infection, 1999. Centers for Disease Control and Prevention (CDC) Hospital Infection Control Practices Advisory Committee. Am J Infect Control. 1999;27(2):97-132
6. Geffers C, Gastmeier P, Daschner F, Rüden H. Prevention of postoperative wound infections. Evidence-based recommendations. Zentralbl Chir. 2001;126(2):84-92. German. doi: 10.1055/s-2001-12415.
7. Barana L, Gastaldo L, Maestri F, Sgarella A, Rescigno G, Prati U, et al. Postoperative infections. A prospective analysis of 1396 cases. Minerva Chir. 1992;47(13-14):1177-87.
8. Emori TG, Gaynes RP. An overview of nosocomial infections, including the role of the microbiology laboratory. Clin Microbiol Rev. 1993;6(4):428-42. doi: 10.1128/CMR.6.4.428.
9. Mawalla B, Mshana SE, Chalya PL, Imirzalioglu C, Mahalu W. Predictors of surgical site infections among patients undergoing major surgery at Bugando Medical Centre in Northwestern Tanzania. BMC Surg. 2011;11:21. doi: 10.1186/1471-2482-11-21.
10. Shah K, Singh S, Rathod J. Surgical site infections: incidence, bacteriological profiles and risk factors in a tertiary care teaching hospital, western India. Int J Med Sci Public Health. 2017;6:173-6. 10.5455/ijmsph.2017.14082016597
11. Kumar A, Rai A. Prevalence of surgical site infection in general surgery in a tertiary care centre in India . Int Surg J. 2017;4:3101. 10.18203/2349-2902.isj20173896
12. Al-Mulhim FA, Baragbah MA, Sadat-Ali M, Alomran AS, Azam MQ. Prevalence of surgical site infection in orthopedic surgery: a 5-year analysis. Int Surg. 2014;99(3):264-8. doi: 10.9738/INTSURG-D-13-00251.1.
13. Hernandez K, Ramos E, Seas C, Henostroza G, Gotuzzo E. Incidence of and risk factors for surgical-site infections in a Peruvian hospital. Infect Control Hosp Epidemiol. 2005;26(5):473-7. doi: 10.1086/502570.
14. Manzoor B, Heywood N, Sharma A. Review of Subcutaneous Wound Drainage in Reducing Surgical Site Infections after Laparotomy. Surg Res Pract. 2015;2015:715803. doi: 10.1155/2015/715803.
15. Segal CG, Waller DK, Tilley B, Piller L, Bilimoria K. An evaluation of differences in risk factors for individual types of surgical site infections after colon surgery. Surgery. 2014;156(5):1253–1260.
16. Lawson EH, Hall BL, Ko CY. Risk factors for superficial vs deep/ organ-space surgical site infections: implications for quality improve- ment initiatives. JAMA Surg. 2013;148(9):849–858.
17. Zhang L, Liu BC, Zhang XY, Li L, Xia XJ, Guo RZ. Prevention and treatment of surgical site infection in HIV-infected patients. BMC Infect Dis. 2012;12:115. doi: 10.1186/1471-2334-12-115.
18. Negi V, Pal S, Juyal D, Sharma MK, Sharma N. Bacteriological Profile of Surgical Site Infections and Their Antibiogram: A Study From Resource Constrained Rural Setting of Uttarakhand State, India. J Clin Diagn Res. 2015;9(10):DC17-20. doi: 10.7860/JCDR/2015/15342.6698.

Source of Support: Nil, Conflict of Interest: None declared