Original article

Surgical site infection after gastrointestinal and hepatobiliary surgeries- A retrospective evaluation from a single centre of western India

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Abstract

Introduction: Aim of our study to evaluate various factors responsible for surgical site infection after gastrointestinal and hepatobiliary surgeries.

Methods: Patient who underwent gastrointestinal and hepatobiliary surgery in our department were evaluated retrospectively. Various factors associated with surgical site infection were evaluated using univariate and multivariate analysis. Surgical site infection was defined as any culture positive discharge from the wound within 30 days of surgery.

Results: We evaluated a total of 331 patients operated between April 2018 and March 2020. 14 patients were lost to follow up after discharge and before completing post operative day 30. Eighteen patients expired before 30 days without developing SSI and were excluded from the study as per exclusion criteria. 299 patients were included in the study. Twenty patients developed surgical site infection. It showed SSI rate in our study population was 6.68%. On univariate analysis prolonged hospital stay, more blood product used, higher CDC grade of surgery, higher ASA grade, more operative time, open surgeries, colorectal and HPB surgeries were associated with surgical site infections. On multivariate analysis only prolonged hospital stay independently predicted SSI. (p=0.014, Odds ratio 1.223, 95% confidence interval 1.042-1.435.).

Conclusion: Prolonged hospital stay independently predicts surgical site infections after gastrointestinal and hepatobiliary surgery.

Key words: Hospital stay; HPB surgery; Morbidity; Mortality; Surgical Site Infections .

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Disclosures:

Ethical Clearance: IRB 345/Shalby/2020

Conflict of interest: None

Financial aid: None

How to cite this article:

Vasavada B, Patel H. Surgical site infection after gastrointestinal and hepatobiliary surgeries- A retrospective evaluation from a single centre of western India. J Soc Surg Nep. 2020 Dec;23(2):31-35.

DOI:
https://doi.org/10.3126/jssn.v23i2.35802

Introduction

According to world health organisation (WHO) health care associated infections is the emerging health care problem.[1] Surgical site infections (SSI) are one of the most common healthcare associated infections.[2] SSI increases hospital stay, cost and also some times is associated with increase mortality.[3]

Various studies have evaluated epidemiology of SSI in India,[4,5] however very few studies have evaluated SSI after gastrointestinal and hepatobiliary surgeries in India.

The aim of our study was to evaluate various factors responsible for SSI after gastrointestinal and hepatobiliary surgery.

Methods

Patients who underwent gastrointestinal (GI) and hepatobiliary (HB) surgery between April 2018 and March 2020 in our department were evaluated retrospectively. Various factors associated with surgical site infection were evaluated using univariate and multivariate analysis.

Surgical site infection definition:

Surgical site infection was defined as any culture positive discharge from the wound within 30 days of surgery.[6,7] We did not use Center for Disease Control (CDC) criteria because it described all kind of surgeries and was non-specific for abdominal surgeries. If we used CDC criteria complications like asymptomatic biloma or collections would also come under the definition of surgical site infection.

Inclusion Criteria:

•All patients who underwent GI and HB surgery.
•All patients with preexisting abdominal infections were included in the study

Exclusion criteria:

•Patients lost to follow up before completing 30 postoperative days
•Patient expired before 30 days without developing SSI

Antibiotic protocol:

We give single dose pre-operative antibiotic (preferably third generation cephalosporin with extended spectrum beta-lactam coverage as per our hospital sensitivity data) at the time of induction to all patients without pre-existing sepsis and septic shock.[8] We give antibiotics according to survival sepsis guidelines in patients with established sepsis using pre calcitonin level as the guide.[9]

Factors Evaluated:

We evaluated various factors associated with SSI:
•Age
•Sex
•Open or Laparoscopic Surgeries
•Emergency Surgeries
•Type of surgeries (Upper GI, HPB, Small bowel, Colorectal, Hernia)
•Benign or malignant surgeries
•CDC grade of surgeries[10]
•American society of anesthesiology (ASA) classification[11]
•Hospital stay before the diagnosis of SSI
•Blood product requirement
•Operative Time

We also evaluated whether SSI is associated with other complications and mortality.

Statistical analysis:

Analysis of means or medians was selected according to skewness and standard error of skewness, and kurtosis and standard error of kurtosis analysis. Categorical variants were analysed using chi square test or fisher exact test where appropriate. Continuous variable were analysed using Mann Whitney u test. P value less than 0.05 was considered significant. Multivariate analysis was done using logistic regression method. SPSS (IBM) version 23 was used for statistical analysis. Ethical clearance for the study was obtained from hospital ethical committee. IRB 345/Shalby/2020

Results

Study population:

We evaluated a total of 331 patients operated between April 2018 and March 2020. Fourteen patients were lost to follow up after discharge and before completing post operative day 30. Eighteen patients expired before 30 days without developing SSI and were excluded from the study as per exclusion criteria. A total of 299 patients were included in the study (**Figure 1**). Twenty (6.68%) patients developed SSI. Twelve patients had superficial SSI, four had deep SSI and four had organ space infection.

Number of patients according to the type of surgeries is described in **Table 1** and Grade of surgeries in **Table 2**.

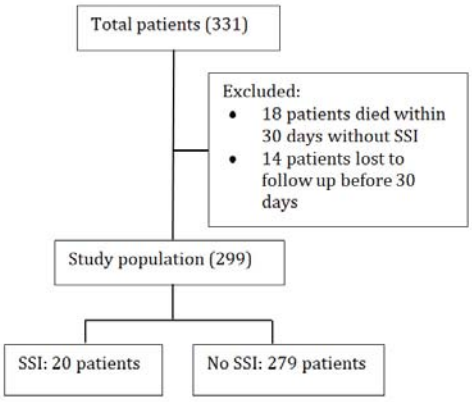

Figure 1. Study Population

Table 1. Types of surgery

Type of surgery	Number of patients (SSI/No SSI)	P value
Upper GI (stomach and esophagus)	2/11	0.19
Small bowel	6/29	0.082
HPB (Hepato pancreatico biliary Surgery)	4/177	0.001
Colorectal Surgery	7/35	0.016
Hernia	1/31	0.4

Table 2. CDC grade of surgeries

Grade of surgeries	Total Number of Patients
Clean (grade 1)	3
Clean contaminated (Grade 2)	158
Contaminated (Grade 3)	110
Dirty (Grade 4)	28

Univariate analysis:
On univariate analysis prolonged hospital stay, more blood product used, higher cdc grade of surgery, higher ASA grade, more operative time, open surgeries, colorectal and HPB surgeries were associated with surgical site infections (**Table 3**).

Multivariate analysis:
On multivariate analysis only prolonged hospital stay before diagnosis of surgical site infections independently predicted Surgical Site Infections. (p=0.014, Odds ratio 1.223, 95% confidence interal 1.042-1.435.) Here prolonged hospital stay is defined as perioperative hospital stay before diagnosis of surgical site infection (**Table 4**).

Relationship with other complications and mortality:
SSI was associated with other non SSI complications (p=0.002) but not associated with mortality. (p=0.338)

Discussion

Surgical science has progressed to a great extent in last century. Despite such a great progress Surgical site infection remains a major challenge and its incidence rates still remains high due to prevalence of wide range of protocols and practices.[12] Causes of Surgical site infection can be multifactorial and include variety of patient related, hospital related and procedural related factors and it includes use of variery of protocols and procedures to prevent them.[13]

This retrospective study evaluated risk factors and their association with surgical site infections. Over all SSI rates were 6.76 percent in our data. Multicenter study published showed over SSI rates after gastrointestinal surgeries were

Table 3. Univariate analysis for SSI

Factors	No SSI (n=279)	SSI (n= 20)	P Value
Age (median/range)	54 (7-83)	50 (34-65)	0.486
Sex (M/F)	180/99	12/8	0.156
Pre SSI diagnosis Hospital stay(median/range) vs total hospital stay in non SSI group	2 (1-15)	5.5 (1-20)	P<0.0001
No of Blood products used(median/range)	0 (0-8)	0.5 (0-4)	P=0.001
CDC grade of surgery(median/range)	2 (1-4)	3 (2-4)	P<0.0001
ASA score (median/range)	2 (1-4)	3 (2-4)	P<0.0001
Operative time (median/range) (minutes)	90 (15-600)	120 (45-420)	P=0.004
Emergency Surgery (n=45)	42	2	P=1.000
Open Surgeries (n=154)	19	135	P<0.0001
HPB (n=177)	173	4	P=0.001
Colorectal (n=42)	35	7	P=0.016
90 days Mortality	14	2	P=0.338

Table 4. Multivariate analysis

Factors	P value	Odds ratio	95% confidence interval
Open surgery	0.996	4.83	0.48-48.48
Blood products	0.135	0.683	0.42-1.12
Asa grade	0.590	1.30	0.494-3.46
Operative time	0.342	1.004	0.996-1.012
Grade of surgery	0.200	2.095	0.677-6.48
Colorectal surgery	0.260	2.075	0.583-7.38
HPB surgery	0.466	0.563	0.120-2.64
Hospital stay	0.014	1.223	1.042-1.435

of 12.3 % which is significantly higher than our data. It showed SSI rates in middle and lower countries are much higher.(14 and 23.2% respectively). Although India is one of the middle to lower income countries, our SSI rates are significantly lower than published results worldwide.[1] Lee et al in their systemic review of korean experience showed SSI rates of around 9.4%, which is almost identical to our data.[14] Reason for lower SSI rates in our data may be due to short course single dose antibiotic protocols and evidence based management of preexisting abdominal infections by survival sepsis protocols.

On univariate analysis higher ASA grade, higher CDC grade of surgery, prolonged surgical time, higher blood products use, open surgeries and prolong hospital stay were associated with SSI. Karol et al in their systemic review also showed that prolong duration of surgery and complexity of surgery were associated with SSI.[15] Carvalho et al showed that higher ASA grades, Higher grade of surgery, and prolonged surgical duration were associated with SSI rates, which was also shown in our data.[16] Varelo et al also showed surgical site infections after laproscopic surgeries was minimal and which is the key benefit of laproscopic surgeries.[17]

In our study multivariate analysis showed that prolonged hospital stay independently predicted surgical site infection. Mujagic et al[18] also showed similar findings.

In our series surgical site infections were also significantly associated with other complications but was not significantly associated with 90 day mortality. (p=0.338). INSISO study group also showed that surgical site infections were signifcantly associated with increased mortality and morbidity.[19]

There are certain limitations of our study being retrospective study inherent limitations of retrospective study also applies to our study. There can also be many other confounding factors which can affect surgical site infections. However, we evaluated many preoperative, intraoperative and postoperative factors by univariate and multivariate analysis to avoid confounding as far as we could but we can not deny some missing factors which may affect outcomes.

Conclusion

Prolonged hospital stay independently predicts surgical site infections after gastrointestinal and hepatobiliary surgery.

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