SURGICAL SITE INFECTIONS IN GASTROINTESTINAL SURGERY AT DANANG ONCOLOGY HOSPITAL

Nguyen Thi Thanh Duyen

ABSTRACT

Background: Surgical site infection (SSI) is a significant postoperative complication, especially in gastrointestinal (GI) surgery in low- and middle-income countries. This study aimed to determine the incidence of SSI and identify its associated risk factors among patients undergoing GI surgery at Da Nang Oncology Hospital.

Methods: A prospective, descriptive analytical study was conducted on 309 patients undergoing GI surgery from January to September 2024. Data on patient demographics, preoperative clinical status, and intraoperative factors were collected. SSI was defined according to the CDC/NHSN criteria and followed for 30 days postoperatively. Statistical significance was set at $p < 0.05$.

Results: The overall incidence of SSI was 12.9% (40/309), with all cases classified as superficial incisional SSIs. Gram-negative bacteria were the predominant pathogens (93.75%), with *Escherichia coli* (50.0%) and *Klebsiella pneumoniae* (28.1%) being most frequent. The SSI rate was significantly higher in contaminated surgeries (50.0%) compared to clean-contaminated procedures (8.7%). Univariate analysis identified significant risk factors ($p < 0.05$) including: comorbidities (16.2%), preoperative hospital stay >7 days (16.1%), ASA score ≥ III (24.5%), history of GI surgery (52.5%), emergency surgery (39.6%), contaminated wound class (46.9%), operative time >120 minutes (16.8%), NNIS risk index ≥3 (48.3%), and open surgical approach (16.0%). All patients achieved complete clinical resolution following treatment.

Conclusions: SSI remains a prevalent challenge in gastrointestinal oncology surgery. The predominance of Gram-negative pathogens and the identification of modifiable risk factors, such as operative duration and preoperative stay, underscore the need for enhanced perioperative infection control protocols and a shift towards minimally invasive techniques to improve patient safety.

Keywords: Surgical site infection, gastrointestinal surgery, risk factors, Escherichia coli, oncology.

Da Nang Oncology Hospital

Corresponding author: Nguyen Thi Thanh Duyen
Email: ksnk.ubdn@gmail.com

Date received: 01/4/2026
Date reviewed: 10/4/2026
Date accepted for publication: 15/4/2026

1. INTRODUCTION

Ensuring surgical safety remains a formidable global challenge, particularly in low- and middle-income countries (LMICs) where healthcare resources are often constrained. Despite substantial advancements in surgical methodology, perioperative technology, and the adoption of minimally invasive techniques, surgical site infection (SSI) persists as a prevalent and significant postoperative complication (1,8). SSIs are inherently linked to extended hospitalizations, escalated healthcare expenditures, and detrimental clinical outcomes (2,6).

Within the Vietnamese context, reported SSI rates fluctuate between 5% and 10%, representing a substantial contribution to the overall burden of disease and the necessity for prolonged antimicrobial therapy (11,13). Patients undergoing gastrointestinal procedures face a disproportionately high risk of SSI. This susceptibility is primarily attributed to the deliberate intraoperative entry into the gastrointestinal tract—a region characterized by a high endogenous microbial load—and the fact that most of these procedures are classified as either clean-contaminated or contaminated according to global standards, such as those defined by the Centers for Disease Control and Prevention (CDC) (6).

While established clinical guidelines from the Ministry of Health and international bodies offer effective preventive measures (4,5,6), their adherence in routine practice remains suboptimal. Systematic surveillance of SSI is therefore essential to generate the empirical evidence required for targeted interventions, ultimately enhancing surgical quality and patient safety. Consequently, the present study was conducted to determine the incidence of SSI and delineate its associated risk factors among patients undergoing gastrointestinal surgery at Da Nang Oncology Hospital...

2. MATERIALS AND METHODS

2.1. Study Population and Setting

This study enrolled patients who underwent gastrointestinal surgery at Da Nang Oncology Hospital between January and September 2024.

Inclusion criteria:

Eligible participants were required to meet the following criteria:

- Underwent either elective or emergency gastrointestinal surgery at the study site during the specified period.

- Received surgical intervention via either an open or laparoscopic approach.

- Provided informed consent for study participation and possessed comprehensive medical records for data extraction.

Exclusion criteria:

- Patients who had undergone gastrointestinal surgery at another facility and were subsequently transferred to Da Nang Oncology Hospital for postoperative management or secondary procedures.

- Patients who were not postoperatively managed at the study hospital.

- Patients who did not complete the mandatory 30-day postoperative follow-up period, which is essential for the definitive diagnosis of surgical site infections (SSIs).(5)

Sample size and sampling method:

The minimum required sample size was calculated using the formula for estimating a single population proportion:

$$\mathbf{N} = \mathbf{Z}^{\mathbf{2}}_{\mathbf{1-\frac{\alpha}{2}}} \frac{\mathbf{p(1-p)}}{\mathbf{d^2}}$$

In which:

- N is the required sample size for the study.

- α is the level of significance (α = 0.05).

- Z = 1.96

- p = 0.238 based on a previous study in oncologic digestive surgery (Brazil, 2010).

- The margin of error, set at 0.05.

- Design effect:1.0

The minimum required sample size for the study is N = 279.

2.2. Study Design and Data Collection

A prospective, cross-sectional descriptive, and analytical study was conducted. The following key variable groups were systematically collected:

Demographic Data: Age, sex, height, weight, and Body Mass Index (BMI).

Preoperative Status: American Society of Anesthesiologists (ASA) physical status, presence of comorbidities, and surgical history.

Intraoperative Variables: Surgical urgency (elective vs. emergency), wound classification (clean, clean-contaminated, contaminated, or dirty), surgical approach (laparoscopic vs. open), type of incision, targeted organ, and operative duration.

SSI Characteristics: Surgical site infections were identified and classified based on the Centers for Disease Control and Prevention (CDC/NHSN) criteria. An SSI must occur within 30 days of the operative procedure and involve only the skin and subcutaneous tissue of the incision (Superficial Incisional SSI), deeper soft tissues such as fascia and muscle layers (Deep Incisional SSI), or any part of the anatomy opened or manipulated during the procedure (Organ/Space SSI). Diagnosis was confirmed by the presence of at least one of the following:

- Purulent drainage from the incision or a drain placed through a stab wound.

- Organisms isolated from an aseptically obtained culture of fluid or tissue.

- At least one symptom of infection (e.g., pain, localized swelling, redness, or heat) and the incision is deliberately opened by a surgeon, unless the culture is negative.

Diagnosis of SSI by the attending surgeon or attending physician. (5,6)

Clinical Outcomes: Prophylactic and therapeutic antibiotic regimens, and final clinical status (recovery, discharge, transfer, or mortality).

2.3. Statistical analysis

Data were analyzed using IBM SPSS Statistics version 20.0.

2.4. Ethical Considerations

The study protocol was reviewed and formally approved by the Ethics Committee) of Da Nang Oncology Hospital. The study was conducted in strict accordance with the ethical principles of the Declaration of Helsinki.

All eligible participants were provided with comprehensive information regarding the study's objectives, procedures, and potential benefits. Written informed consent was obtained from each patient (or their legal guardian) prior to enrollment. Participants were informed of their right to withdraw from the study at any time without any impact on the quality of their medical care. To ensure patient confidentiality, all data were anonymized and coded; personal identifiers were removed during data processing and analysis. The collected information was used solely for research purposes.

3. RESULTS

3.1. General characteristics of the study population

Table 1. Baseline Characteristics of the Study Population (n = 309)

Characteristics	Number of patients (n = 309)	Percentage %
Age Group (years)		
19 - 39	32	10.4
40 - 59	110	35.6
≥ 60	167	54.0
Mean age ± SD (Min;Max)	59.37 ± 13.58 (24; 93)	
Gender		
Male	205	66.3
Female	104	33.7
***BMI* (kg/m^2)**		
Underweight (< 18.5)	76	24.6
Normal weight (18.5 ≤ 23)	198	64.1
Overweight (23 - 27.5)	34	11.0
Obese (≥ 27.5)	1	0.3
Comorbidities		
Present	204	66.0
Absent	105	34.0
Surgical History		
No prior surgery	238	77.0
Prior surgery (Total)	71	23.0
- Prior gastrointestinal surgery (n=71)	40	56.3
- Other surgical procedures (n=71)	31	43.7
ASA Physical Status		
Class I	6	1.9
Class II	193	62.5
Class III	110	35.6
Type of Admission		
Emergency surgery	53	17.2

Characteristics	Number of patients (n = 309)	Percentage %
Elective surgery	256	82.8
Surgical wound classification		
Clean-contaminated	277	89.6
Contaminated	32	10.4
Surgical approach		
Open surgery	187	60.5
Laparoscopic surgery	60	19.4
Combined (Laparoscopic converted to Open)	62	20.1
Operative Time (minutes)		
≤ 120	119	38.5
> 120	190	61.5
Organ Operated		
Esophageal	26	8.4
Gastroduodenal	83	26.9
Small bowel	26	8.4
Colonic	55	17.8
Rectal	66	21.4
Hepatopancreatobiliary (HPB)	45	14.6
Multi-organ procedures	8	2.6
NNIS risk index		
1 point	188	60.8
2 points	92	29.8
3 points	29	9.4
Length of Stay (Mean ± SD)		
Preoperative stay (days)	9.9 ± 6.57	
Total hospital stay (days)	19.06 ± 9.22	
Postoperative wound status		
Normal healing	270	87.4

Characteristics	Number of patients (n = 309)	Percentage %
Swelling, warmth, redness, pain, and purulent discharge from the skin and subcutaneous tissue	39	12.6
NNIS risk index		
1 point	188	60.8
2 points	92	29.8
3 points	29	9.4
**Note: 100% (n=309) of patients received prophylactic antibiotics*		

The mean age of the study population was 59.37 ± 13.58 years. The majority of patients had comorbidities (66.0%). Among those with a surgical history, 56.3% had undergone prior gastrointestinal procedures. Regarding physical status, 35.6% were classified as ASA score ≥ III. Most patients underwent elective surgery (82.8%), and the vast majority of procedures were clean-contaminated (89.6%).

Gastroduodenal procedures accounted for the largest proportion (26.9%), followed by rectal (21.4%) and colonic surgeries (17.8%), whereas multi-organ procedures were uncommon (2.6%). Open surgery was the predominant approach (60.5%), while laparoscopic and combined approaches accounted for the remainder.

In terms of surgical risk, 60.8% of patients had an NNIS risk index of 1, while 9.4% reached a score of 3. The operative time exceeded 120 minutes in 61.5% of cases. The mean preoperative hospital stay was 9.9 ± 6.57 days, with an overall mean length of hospital stay of 19.06 ± 9.22 days.

3.2. Surgical site infection rate in gastrointestinal surgery

3.2.1. Severity of surgical site infection

Table 2. Incidence and Severity of Surgical Site Infection (n = 309)

Characteristics	Frequency (n)	Percentage %
Incidence of SSI (N=309)		
Present	40	12.9
Absent	269	87.1
Timing of SSI Diagnosis		
Inpatient	40	100.0
Post-discharge	0	0.0
Classification of SSI		
Superficial incisional	40	100.0
Deep incisional	0	0.0
Organ/space	0	0.0

The overall incidence of surgical site infection (SSI) was 12.9%. Regarding severity, all cases (100%) were classified as superficial incisional SSIs.

3.2.2. SSI rate according to type of surgery and operated organ

Characteristics	Total Patients (n = 309)	SSI Cases (n = 40)	SSI Rate %
Wound Classification			
Clean-contaminated	277	24	8.7
Contaminated	32	16	50.0
Operated organ			
Esophagus	26	4	15.4
Gastroduodenal	83	7	8.4
Small bowel	26	5	19.2
Colonic	55	8	14.5
Rectal	66	12	18.2
Hepatopancreatobiliary (HPB)	45	3	6.7
Multivisceral (≥ 2 organs)	8	1	12.5
*Note: Clean and Dirty wounds were not observed in this study population.			

The incidence of SSI was significantly associated with wound classification. Specifically, contaminated procedures exhibited a substantially higher infection rate (50.0%) compared to clean-contaminated procedures (8.7%). Regarding the anatomical site, the highest infection rates were observed in small bowel (19.2%) and rectal surgeries (18.2%). In contrast, hepatobiliary and pancreatic procedures showed the lowest infection rate at 6.7%. Multivisceral and esophageal surgeries had SSI rates of 12.5% and 15.4%, respectively.

3.2.3. Causes of surgical site infection (SSI)

Table 4. Microbiological Culture Results from SSI Cases (n = 40)

Specimen Type	Number of specimens	Pathogen-Positive Cultures (n)	Positivity Rate (%)
Pus, wound discharge	40	32	80.0

A total of 40 specimens, consisting of pus and wound exudates from SSI cases, were submitted for microbiological culture. The culture positivity rate was 80.0% (n = 32), while the remaining 20% yielded no identifiable growth, possibly due to prior antibiotic administration or fastidious organisms.

Table 5. Distribution of Isolated Pathogens (n = 32)

Pathogen characteristics	Frequency (n)	Percentage (%)
Number of isolates per specimen		
Single pathogen	32	100
Polymicrobial (≥2 pathogens)	0	0.0
Bacterial Classification		
Gram-negative bacteria	30	93.75
Gram-positive bacteria	2	6.25
Identified Species		
Escherichia coli	16	50
Pseudomonas aeruginosa	2	6.25
Klebsiella pneumoniae	9	28.1
Proteus mirabilis	3	9.4
Enterococcus spp	2	6.25

Monotherapy was observed in all culture-positive cases, with no polymicrobial infections recorded. Gram-negative bacilli predominated the microbial profile, accounting for 93.75% of the total isolates. Among these, *Escherichia coli* was the most prevalent pathogen (50.0%), followed by *Klebsiella pneumoniae* (28.1%). Gram-positive bacteria, specifically *Enterococcus* spp., represented a small fraction of the cases (6.25%).

3.2.4. Factors associated with surgical site infection in gastrointestinal surgery

Table 6. Factors Associated with Surgical Site Infection (n = 309)

Charateristics	SSI (n=40)	No SSI (n=269)	Total (n=309)	p-value
Age Groups (years)				0.585
19-39	3 (9.4%)	29 (90.6%)	32	
40-59	17 (15.5%)	93 (84.5%)	110	
≥ 60	20 (12%)	147 (88%)	167	
Gender				0.868
Male	27 (13.2%)	178 (86.8%)	205	
Female	13 (12.5%)	91 (87.5%)	104	
Nutritional Status (BMI)				0.978
Malnutrition	10 (13.2%)	66 (86.8%)	76	
Normal weight	26 (13.1%)	172 (86.9%)	198	
Overweight	4 (11.8%)	30 (88.2%)	34	

Charateristics	SSI (n=40)	No SSI (n=269)	Total (n=309)	p-value
Obese	0 (0.0%)	1 (100.0%)	1	
Comorbidities				0.018*
Absent	7 (6.7%)	98 (93.3%)	105	
Present	33 (16.2%)	171 (83.8%)	204	
Preoperative hospital stay				0.035*
≤ 7 days	11 (8.5%)	118 (91.5%)	129	
> 7 days	29 (16.1%)	151 (83.9%)	180	
ASA Physical Status				< 0.001*
< III	13 (6.5%)	186 (93.5%)	199	
≥ III	27 (24.5%)	83 (75.5%)	110	
Surgical History				
No history of surgery	26 (10.9%)	212 (89.1%)	238	0.065
History of GI surgery	21 (52.5%)	19 (47.5%)	40	< 0.001*
Type of Admission				< 0.001*
Elective	19 (7.4%)	237 (92.6%)	256	
Emergency	21 (39.6%)	32 (60.4%)	53	
Wound Classification				< 0.001*
Clean-contaminated	25 (9.0%)	252 (91.0%)	277	
Contaminated	15 (46.9%)	17 (53.1%)	32	
Operative time				0.014*
≤ 120 mins	8 (6.7)	111 (93.3)	119	
> 120 mins	32 (16.8)	158 (83.2)	190	
NNIS Risk Index				< 0.001*
NNIS < 3 points	26 (9.3)	254 (90.7)	280	
NNIS ≥ 3 points	14 (48.3)	15 (51.7)	29	
Surgical Site				0.036*
Esophageal Procedures	4 (15.4%)	22 (84.6%)	26	
Gastroduodenal surgery	7 (8.4%)	76 (91.6%)	83	
Small bowel surgery	5 (19.2%)	21 (80.8%)	26	
Colonic surgery	8 (14.5%)	47 (85.5%)	55	
Rectal surgery	12(18.2%)	54 (81.8%)	66	

Charateristics	SSI (n=40)	No SSI (n=269)	Total (n=309)	p-value
Hepatopancreatobiliary (HPB)	3 (6.7%)	42 (93.3%)	45	
Surgical Approach				0.039*
Laparoscopic	2 (3.33)	58 (96.7)	60	
Open	30 (16)	157 (84)	187	
Combined (Laparoscopic/Open)	8 (12.9)	54 (87.1)	62	
**Statistically significant (p < 0.05)*				

The incidence of surgical site infection (SSI) was significantly higher in patients with comorbidities compared to those without (16.2% vs. 6.7%, (p = 0.018). Similarly, a prolonged preoperative hospital stay of more than 7 days was associated with an increased SSI rate compared to a stay of ≤7 days (16.1% vs. 8.5%, (p = 0.035).

Regarding physical status and surgical history, patients with an ASA score ≥III exhibited a substantially higher SSI incidence than those with an ASA score < III (24.5% vs. 6.5%, (p < 0.001). Notably, a history of prior gastrointestinal surgery emerged as a strong predictor of infection, with an incidence rate of 52.5% (p < 0.001).

The NNIS risk index also showed a significant correlation with outcomes; the SSI rate was markedly higher in patients with an NNIS score ≥3 compared to those with a score < 3 (48.3% vs. 9.3%, (p < 0.001). Furthermore, significant associations were observed between SSI and the type of surgery (emergency vs. elective), operative duration (> 120 minutes), and the surgical approach, with all variables reaching statistical significance (p < 0.05).

3.2.5. Treatment outcomes of surgical site infection (SSI)

Table 7. Clinical Outcomes of Patients with SSI (n = 40)

Outcome Category	Number of patients	Percentage %
Successful SSI Resolution	40	100.0
Hospital Transfer	0	0
Discharge Against Medical Advice (DAMA)	0	0
Mortality	0	0
Total	40	100.0

Regarding the clinical outcomes of postoperative complications, complete resolution of surgical site infections was achieved in 100.0% (n = 40) of the affected cases.

4. DISCUSSION

4. 1. General characteristics of the Study Population

The demographic profile of the cohort revealed a predominance of elderly patients, with 54% aged ≥60 years (mean age: 59.37 ± 13.58 years). This distribution is consistent with the study by Hegde et al. (1), which also identified older age as a significant factor in the surgical population. A male preponderance (66.3%) was observed, aligning with findings by Tran Que Son

(2) and Zhiwei Wang (3), reflecting established epidemiological patterns in gastrointestinal diseases.

Regarding nutritional status, the prevalence of obesity was remarkably low (0.3%), whereas undernutrition affected 24.6% of the population. This high rate of malnutrition is typical in oncological patients and corresponds with results reported by Tran Que Son (2). A significant proportion of patients presented with comorbidities (66%) and a history of prior surgery (23%), both of which are recognized factors that elevate the risk of surgical site infection (SSI). Preoperative physical status was primarily classified as ASA II (62.5%) and ASA III (35.6%); notably, higher ASA scores were identified as a critical risk factor, echoing the conclusions of both Zhiwei Wang (3) and Hegde et al. (1).

Most procedures were elective (82.8%), a higher rate than those reported in other domestic oncology settings (11,12), likely due to the specialized nature of the oncology hospital. In accordance with guidelines from the Ministry of Health and the CDC (4,5,6), the majority of cases involved clean-contaminated wounds (89.6%). Although 61.5% of surgeries exceeded 120 minutes—a known risk factor also highlighted in Hegde et al.'s analysis (1)—the mean preoperative hospital stay (9.9 days) and overall stay (19.06 days) were relatively prolonged, potentially increasing patient exposure to nosocomial pathogens. Notably, the overall SSI rate in this study (12.9%) was significantly lower than the 24% incidence reported by Hegde et al. (1), a variance that may be attributed to differences in sample size, surgical complexity, and the specific perioperative protocols employed.

4. 2. Surgical site infection (SSI) rate in gastrointestinal surgery

In this study of 309 patients, the SSI incidence was 12.9%. While this rate is lower than those reported in international literature, such as the 24% observed by Hegde et al. (1) and rates in other global cohorts (8,9), it is higher than the 7.5% reported domestically by Tran Que Son (2). Nevertheless, the incidence remains within the globally reported range of 5–30%. Interestingly, all SSI cases (100%) in this cohort were classified as superficial, with no deep or organ/space infections identified. This deviates from studies by Nguyen Thi Bich Ngoc (12) and other domestic authors (11,13), who documented all three classifications of SSI. This discrepancy may reflect rigorous postoperative wound care and effective infection control protocols at the study site.

The SSI rate for clean-contaminated procedures (8.7%) aligned with the Ministry of Health's benchmarks of 5–10% (4,5). Conversely, contaminated procedures exhibited a markedly higher infection rate (50%), predominantly in cases of intestinal obstruction or hollow viscus perforation, a finding consistent with the high risk associated with contaminated surgical fields (1,6). Anatomically, the highest SSI rates occurred in small bowel (19.2%) and rectal surgeries (18.2%), whereas the lowest was observed in hepatobiliary and pancreatic procedures (6.7%), aligning with established surgical site risk profiles (3,8).

4.3. Causes of surgical site infection in gastrointestinal surgery

Bacterial cultures were positive in 80% of SSI specimens, showing a stark predominance of Gram-negative organisms (93.75%). Escherichia coli was the most frequently isolated pathogen (50%), followed by Klebsiella pneumoniae (28.1%). Notably, all identified infections in this cohort were monomicrobial.

The 80% culture positivity rate in this study is significantly higher than the 47% reported by

Siddiqui et al. (7). However, both studies show a consensus on the microbial profile, with E. coli being the primary driver of SSIs in gastrointestinal surgery, accounting for 50% in this study compared to 36.4% in the reference study (7). The high prevalence of Gram-negative bacilli reinforces the theory that SSIs in gastrointestinal procedures primarily originate from endogenous enteric flora (1,8).

Cases with negative cultures in this study (20%) may be attributed to preoperative antibiotic administration or the presence of fastidious organisms. Furthermore, as the diagnostic focus was limited to aerobic cultures, the role of anaerobic pathogens—which are common in the gut—may be underestimated (6,7). These findings highlight the necessity of targeted antibiotic prophylaxis and the potential for developing local antibiograms to manage Enterobacteriaceae-related infections effectively (5).

4.4. Factors associated with surgical site infection in gastrointestinal surgery

The present study identified several clinical and operative variables significantly associated with the development of surgical site infection (SSI). Statistically significant factors included the presence of comorbidities, a preoperative hospital stay exceeding 7 days, an impaired preoperative physical status (ASA ≥ III), and emergency surgical intervention. Furthermore, contaminated wound classification, the specific organ operated upon (notably small bowel and rectal procedures), prolonged operative duration, an NNIS risk index ≥ 3, and the open surgical approach were also confirmed as critical predictors.

Specifically, our results echo those of Tran Que Son (2) and Zhiwei Wang (3), who reported significant correlations between ASA scores, wound classification, and SSI incidence. Similarly, the impact of extended operative time and emergency procedures in elevating infection risks aligns with findings by Hegde et al. (1) and domestic reports (11). Regarding the duration of hospitalization, our findings are consistent with established literature identifying prolonged preoperative stays as a significant risk factor, potentially due to increased exposure to nosocomial pathogens (12,13). Additionally, the correlation between a high NNIS risk index and increased SSI susceptibility supports the conclusions drawn by the CDC and other surveillance studies (6,12).

Conversely, demographic and anthropometric factors such as age, sex, and BMI did not show statistically significant associations with SSI. These observations are in agreement with studies conducted by Tran Que Son (2) and other regional analyses (10). Although some literature identifies obesity as a risk factor, this association was not replicated in our cohort, likely due to the exceptionally low prevalence of obesity (0.3%) within the study population. Furthermore, while the universal administration of prophylactic antibiotics (100%) adhered strictly to clinical guidelines (4,5), this uniformity precluded an objective evaluation of its efficacy as a comparative risk factor. In summary, the risk of SSI is primarily driven by the patient's preoperative clinical status, procedural complexity, and the duration of hospital exposure, reinforcing the need for targeted perioperative management in high-risk groups (1,8).

4.5. Treatment outcomes

Regarding clinical outcomes, complete resolution of surgical site infections was achieved in 100% of the affected cases, with all patients subsequently discharged in stable condition. There were no recorded instances of persistent infection, inter-hospital transfers, or procedure-related mortality within this cohort. These results align with the findings of Pham Van Tan (14)

and Nguyen Thi Bich Ngoc (12), reflecting a high degree of therapeutic efficacy in managing postoperative complications.

The favorable prognosis observed in this study can be attributed to early detection through systematic surveillance and the application of standardized wound care protocols as recommended by the Ministry of Health (4,5). In summary, although the occurrence of SSI is inherently associated with prolonged hospitalization, the implementation of effective clinical management and evidence-based nursing interventions resulted in successful recovery for all patients. These findings reinforce the importance of maintaining rigorous infection control standards to mitigate the clinical impact of SSIs in oncology-focused surgical settings (6,11).

5. CONCLUSION

In this study of 309 patients undergoing gastrointestinal surgery at Da Nang Oncology Hospital in 2024, the incidence of surgical site infection (SSI) was 12.9%. Microbiological analysis revealed a high culture positivity rate of 80%, with a marked predominance of Gram-negative bacteria (93.75%). *Escherichia coli* was the most prevalent pathogen (50%), followed by *Klebsiella pneumoniae* (28.1%), *Proteus mirabilis* (9.4%), *Pseudomonas aeruginosa*, and *Enterococcus* spp. (6.25% each). Notably, all identified infections were monomicrobial.

Several critical risk factors were significantly associated with an increased SSI incidence, including the presence of comorbidities, a preoperative stay exceeding 7 days, ASA score ≥III, a history of gastrointestinal surgery, and emergency procedures. Additionally, contaminated wound classification, small bowel surgery, operative duration > 120 minutes, and an NNIS risk index ≥ 3 were identified as major predictors of infection.

Regarding therapeutic outcomes, 100% of patients with SSI achieved complete resolution and were discharged in stable condition, with a mean hospital stay of 19.06 ± 9.22 days. In summary, while SSI in gastrointestinal surgery is frequently caused by endogenous Gram-negative flora and influenced by multiple perioperative factors, effective clinical management ensures a favorable prognosis and high recovery rates.

REFERENCES

[1]. Hegde S, S R, S G, et al. Incidence and Risk Factors of Surgical Site Infections in Gastrointestinal Surgeries: A Prospective Observational Study. Cureus. 2024;16(6):e62589. doi: 10.7759/cureus.62589.

[2]. Tran QS. Risk factors related to surgical site infection in patients after hepatopancreatobiliary and gastrointestinal surgery: A retrospective study of 120 cases at Bach Mai Hospital. J Med Res. 2023;169(8):173-81.

[3]. Wang Z, et al. Surgical Site Infection After Gastrointestinal Surgery in China: A Multicenter Prospective Study. J Surg Res. 2019;240:206-18.

[4]. Ministry of Health (Vietnam). Guideline on prevention of surgical site infections (Issued with Decision No. 3671/QD-BYT). Hanoi: Medical Publishing House; 2012.

[5]. Ministry of Health (Vietnam). Guideline on surveillance of surgical site infections (Issued with Decision No. 1526/QD-BYT). Hanoi: Ministry of Health; 2023.

[6]. Centers for Disease Control and Prevention (CDC). Surgical Site Infection (SSI) Event. Procedure-associated Module. National Healthcare Safety Network (NHSN); 2024. Available from: cdc.gov

[7]. Siddiqui J, Masih S, Masih S, et al. A study on the bacterial profile and antibiotic resistance of surgical site infections. Bioinformation. 2025;21(3):231-235. doi: 10.6026/973206300213231.

[8]. Adriano C, et al. Surgical site infection in resections of digestive system tumors. PubMed [Internet]. 2024. Available from: nih.gov

[9]. Aga E, Keinan-Boker L, Eithan A, Mais T, Rabinovich A, Nassar F. Surgical site infections after abdominal surgery: incidence and risk factors. A prospective cohort study. Infect Dis (Lond). 2015;47(11):761-7.

[10]. Nguyen NB, Nguyen QA. Risk factors for surgical site infection. Hanoi: Medical Publishing House; 2013.

[11]. Nguyen QA, Nguyen VH, Pham NT. Incidence and risk factors of surgical site infection in some Vietnamese hospitals, 2009 - 2010. J Pract Med. 2012;830(7):28-32.

[12]. Nguyen TBN, Nguyen H, Truong QT. Assessment of surgical site infection and related factors in gastrointestinal surgery patients at Thanh Nhan Hospital. Vietnam Med J. 2021;507(1):161-5.

[13]. Nguyen VH, Truong AT, et al. Prevalence, etiology and related factors of hospital-acquired infection in 25 general hospitals in Hanoi. Vietnam Med J. 2022;Special Issue:3-11.

[14]. Pham VT. Study on surgical site infection in gastrointestinal surgery at Bach Mai Hospital [Doctoral dissertation]. Hanoi: Military Medical Academy; 2016.