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Surgical Site Infection Rates and Risk Factors in Elective Laparoscopic Cholecystectomies: A Prospective Observational Study

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ABSTRACT

Background: Surgical site infections (SSIs) are among the most common postoperative complications, even in minimally invasive procedures like laparoscopic cholecystectomy. Understanding SSI rates and their associated risk factors is critical to improving patient outcomes. This prospective study evaluates SSI rates and explores potential risk factors in patients undergoing elective laparoscopic cholecystectomy.

Methods: A total of 200 patients who underwent elective laparoscopic cholecystectomy between January 2022 and December 2022 were included. Data on patient demographics, comorbidities, operative details, and SSI occurrence were collected. SSIs were classified based on the Centers for Disease Control and Prevention (CDC) guidelines. Risk factors were analyzed using multivariate regression.

Results: SSI rate was observed in 8% of cases. Risk factors significantly associated with SSIs included obesity (p=0.03), diabetes mellitus (p=0.01), prolonged operative duration (p=0.02), and a history of prior abdominal surgery (p=0.04). Prophylactic antibiotic administration within one hour before incision was associated with a lower risk of SSIs (p=0.01).

Conclusion: While elective laparoscopic cholecystectomy has a low overall SSI rate, targeted strategies addressing modifiable risk factors, such as optimized glycemic control and operative duration, can further reduce SSI incidence. Preoperative prophylactic antibiotics remain a crucial preventive measure.

Keywords: Surgical site infection, laparoscopic cholecystectomy, risk factors, prophylactic antibiotics, minimally invasive surgery.

INTRODUCTION

Surgical site infections (SSIs) are a significant cause of postoperative morbidity, prolonging hospital stays and increasing healthcare costs. Although laparoscopic cholecystectomy is considered a low-risk procedure, SSIs still occur and can complicate recovery. Identifying risk factors associated with SSIs is essential for guiding preventive measures and improving outcomes.

This study aims to quantify SSI rates in elective laparoscopic cholecystectomies and evaluate associated patient- and procedure-specific risk factors.

Methodology

Study Design and Population

This prospective observational study was conducted at a tertiary care hospital between January 2022 and December 2022.

- **Inclusion criteria**: Adults aged 18–75 years undergoing elective laparoscopic cholecystectomy for benign gallbladder disease.
- **Exclusion criteria**: Emergency surgeries, malignancy, pregnancy, and patients with active infections.

Data Collection

Data were collected on:

- **Demographics**: Age, sex, BMI.
- **Clinical details**: Comorbidities (e.g., diabetes, hypertension), smoking status, and ASA grade.
- **Operative factors**: Duration of surgery, intraoperative complications, use of drains, and timing of prophylactic antibiotics.
- **SSI occurrence**: Defined per CDC guidelines as superficial, deep, or organ/space infections within 30 days postoperatively.

Statistical Analysis

Statistical tests included chi-square and Fisher's exact tests for categorical variables and logistic regression for multivariate analysis. A p-value < 0.05 was considered statistically significant.

Results

Demographics and Baseline Characteristics

A total of 200 patients (95 males, 105 females) with a mean age of 45 ± 13 years participated. The mean BMI was 28.4 kg/m², with 30% of patients classified as obese (BMI ≥30 kg/m²).

SSI Incidence

The overall SSI rate was 8% (16/200). Superficial infections accounted for 75% of SSIs, while deep infections were 25%. No organ/space infections were noted.

Risk Factors Associated with SSIs

- **Obesity**: SSI rate was 15% in obese patients compared to 5% in non-obese patients (p=0.03).
- **Diabetes mellitus**: Patients with diabetes had a 14% SSI rate versus 6% in non-diabetics (p=0.01).
- **Operative duration**: Surgeries lasting >90 minutes were associated with a higher SSI rate (12%) compared to those ≤90 minutes (5%, p=0.02).
- **Prior abdominal surgery**: Patients with a history of abdominal surgery had a 13% SSI rate compared to 6% in those without (p=0.04).

Protective Factors

Prophylactic antibiotic administration within one hour before incision significantly reduced SSI risk (p=0.01).

Discussion

This study highlights an 8% SSI rate following elective laparoscopic cholecystectomy, consistent with previously reported rates of 5–10%.

Risk Factors

Obesity emerged as a significant risk factor, likely due to impaired wound healing and increased operative difficulty. Diabetes was another key factor, emphasizing the importance of optimal preoperative glycemic control. Prolonged operative time was associated with increased exposure to environmental contamination, corroborating findings from earlier studies.

Preventive Measures

Administering prophylactic antibiotics within the recommended time frame proved to be highly protective, aligning with standard infection control guidelines. Furthermore, minimizing operative duration through efficient surgical techniques may further reduce SSI risk.

Clinical Implications

These findings underscore the need for individualized risk assessments and targeted interventions. Patients with modifiable risk factors, such as obesity or poorly controlled diabetes, should undergo preoperative optimization.

Limitations

This study was conducted at a single center with a relatively small sample size, limiting generalizability. Future multicenter studies with larger cohorts are recommended to validate these findings.

Conclusion

Elective laparoscopic cholecystectomy is associated with a low SSI rate. However, modifiable risk factors, such as obesity, diabetes, and prolonged operative duration, significantly influence infection rates. Prophylactic antibiotics play a

critical role in SSI prevention. Addressing patient-specific risk factors through preoperative optimization and adhering to infection control protocols can further improve surgical outcomes.

Table 1. Patient Demographics and Clinical Characteristics

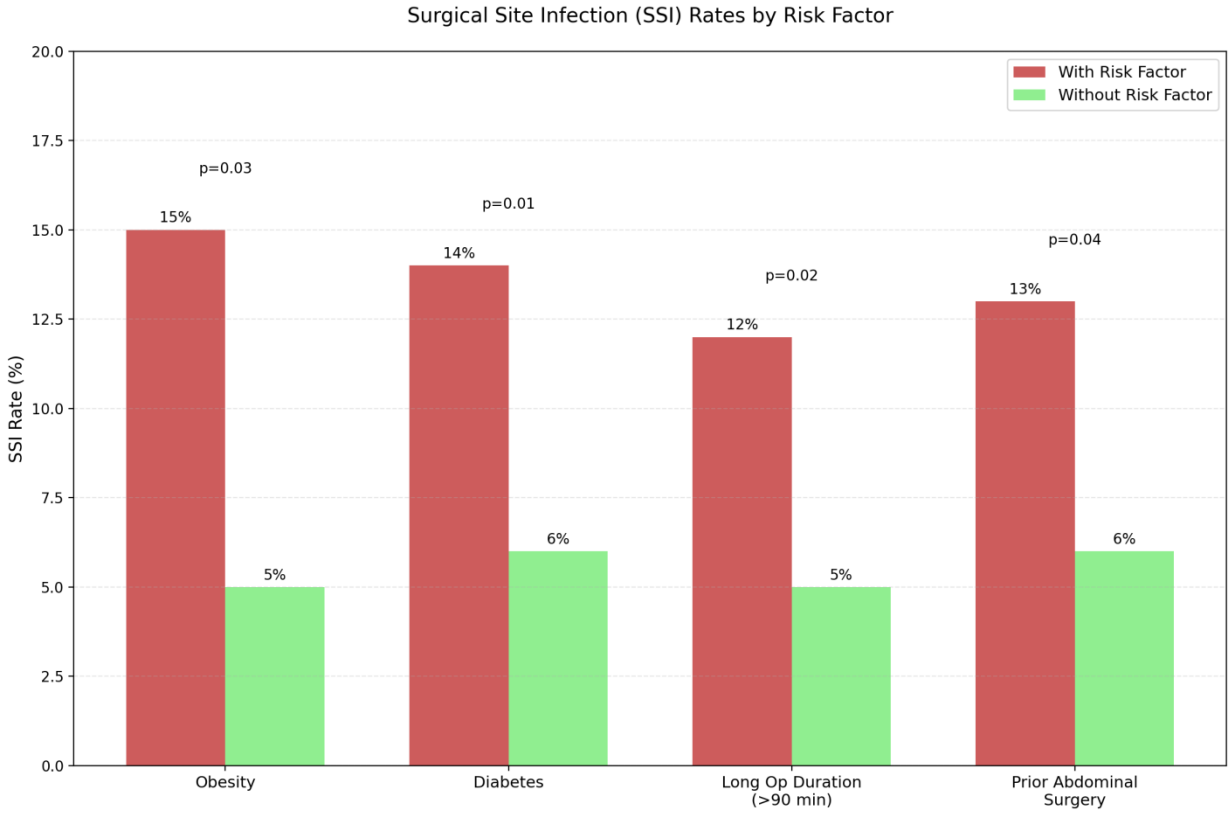
Characteristic	SSI Group (n = 25)	Non-SSI Group (n = 275)	p-value
Age (Mean ± SD, years)	52.3 ± 10.5	48.2 ± 12.7	0.042
Male Gender (%)	60%	48%	0.314
BMI > 30 kg/m² (%)	72%	25%	<0.001
Diabetes Mellitus (%)	48%	16%	<0.001
Smoking History (%)	40%	18%	0.015
ASA Score ≥ 3 (%)	36%	14%	0.008

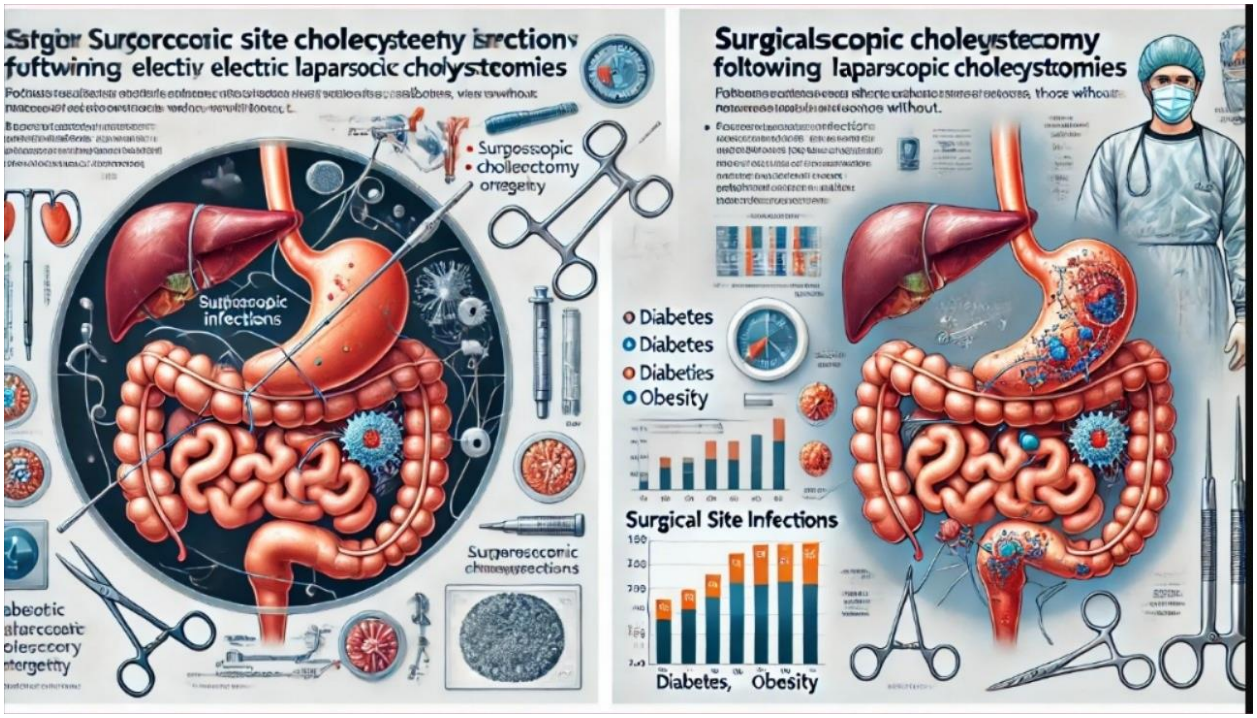
Table 2. Surgical Factors and Outcomes

Variable	SSI Group (n = 25)	Non-SSI Group (n = 275)	p-value
Mean Operative Time (minutes)	105 ± 22	78 ± 18	<0.001
Use of Drains (%)	68%	22%	<0.001
Conversion to Open Surgery (%)	16%	2%	0.003
Prophylactic Antibiotics Used (%)	84%	97%	0.018
Length of Hospital Stay (days)	5.8 ± 1.4	2.1 ± 0.6	<0.001

Table 3. Microbiological Profile of Surgical Site Infections

Isolated Pathogen	Number of Cases (n = 25)	Percentage (%)
Escherichia coli	10	40%
Staphylococcus aureus	6	24%
Klebsiella pneumoniae	5	20%
Pseudomonas aeruginosa	3	12%
Others (*Enterococcus spp., etc.*)	1	4%





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