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Surgical Site Infection: Experience of the General Surgery Department, CHU IBN ROCHD

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ABSTRACT: Surgical site infections (SSI) are responsible for significant morbidity and mortality, as well as human and financial overcosts associated with prolonged hospitalizations and unplanned surgical reoperations.

Awareness and collective commitment of the medical staff are mandatory for controlling these infections.

Estimate the incidence of SSI within a Moroccan general surgery department, analyze its risk factors, and come out with practical recommendations adapted to Moroccan structures.

This is a retrospective study conducted in the general surgery department (Wing I) at CHU Ibn Rochd Casablanca during the period between January 1, 2019, and December 31, 2022.

Risk factors such as age, ASA score, type of intervention, and operative time were collected on a standardized data sheet.

During this four-year period, 2436 patients were operated on; the incidence of surgical site infection in our study was 2.46%, with a 95% confidence interval ranging from 1.92 to 3.16%.

Colorectal surgery represented the intervention that caused the most infections, with a rate of 47%.

All infected patients underwent samples for bacteriological study, processed in the microbiology department. The most found germ was *Escherichia coli* 46.7%. It was sensitive to all antibiotics in 7.4% of cases, sensitive to amoxicillin + clavulanic acid in 35.7%, sensitive to cotrimoxazole in 44%, ESBL-producing in 7.4%, resistant to gentamicin and amikacin in 3.7% and 7.4% respectively.

Age, ASA score, Altemeier contamination class, and type of intervention were the main risk factors found in this study.

SSIs represent a major public health issue.

Prevention relies on rigorous epidemiological monitoring, compliance with hygiene measures surrounding the surgical act, as well as revision of antibiotic therapy protocols and implementation of standardized procedures in surgical departments.

KEYWORDS: surgical site infection, risk factors, prevention, Escherichia coli.

INTRODUCTION

Surgical site infection (SSI) represents one of the most frequent complications of surgical procedures and remains at the forefront of nosocomial infections, despite progress made in terms of aseptic measures and antibiotic prophylaxis (1-2).

SSIs are the cause of significant postoperative morbidity and increased mortality(3).

They are defined as infections occurring at the surgical wound site within 30 days following surgery, or within one year in the case of prosthetic implantation(1).

SSI is a major public health problem due to its socio-economic impact caused by prolonged hospital stays and the severity of sequelae that can lead to patient death(4).

OBJECTIVES

To estimate the incidence of SSIs in a Moroccan general surgery department, analyze its risk factors, and derive practical recommendations adapted to Moroccan healthcare structures.

MATERIALS AND METHODS

We conducted a retrospective, descriptive, and analytical study over a 4-year period from January 2019 to December 2022 in the general surgery department of CHU Ibn Rochd in Casablanca.

Data collection was carried out using a pre-established data sheet and from:

- Medical records

- Nursing records
- Surgical reports
- Anesthesia forms

RESULTS

During the study period, 2436 patients underwent surgical intervention within the department. Among them, 2.46% developed a surgical site infection, i.e., 60 patients.

The average age of patients who developed an SSI was 55 years.

Patient-related risk factors

Among the 60 patients who presented an SSI in our series, there was a female predominance with a percentage of 58.3%.

The majority of the patients in our series, 58 (96.7%), had an ASA score less than 3. Our department is dedicated to scheduled surgery, generally admitting patients with an ASA score less than or equal to 3.

16 patients, i.e., 26.6%, were diabetic, of whom 84.5% had type 2 diabetes and 62.5% had HbA1C > 7%.

In our series, 35 patients had a BMI ≥ 25 kg/m², of whom 13 patients had grade 1 obesity.

18 patients (30%) had inflammatory bowel disease (IBD), including 14 patients with Crohn's disease.

Variable	**SSI Incidence n = 60**
Sex	
Male	25 (41.7%)
Female	35 (58.3%)
ASA Score	
1	25 (41.7%)
2	33 (55%)
3	2 (3.3%)
4	0
Diabetes	16 (26.6%)
Type 1	2 (12.5%)
Type 2	14 (87.5%)
HbA1C > 7%	10 (62.5%)
Overweight (BMI 25–29.9)	22 (36.7%)
Obesity	
Grade 1 (BMI 30–34.9)	13 (21.7%)
Grade 2 (BMI 35–39.9)	0
Grade 3 (BMI > 40)	0
Malnutrition	6 (10%)
Smoking	9 (15%)
IBD	18 (30%)
Crohn’s Disease	14 (23.3%)
Ulcerative Colitis	4 (6.7%)
Corticosteroid therapy	15 (25%)
Chemotherapy and/or radiotherapy	12 (20%)

Intervention-related risk factors

The infectious risk is all the more elevated when preoperative hospitalization duration is long — the average in our study was 5 days.

The rate of SSIs varies depending on the type of surgery, which can be classified according to the organ operated on or the surgical approach. Colorectal interventions are the most exposed to SSIs, followed by small bowel surgeries. In our study, the rates were respectively 36.2% and 17.9%.

In our study, no infections were recorded for laparoscopic interventions.

36.5% of the infected patients had a stoma, and 51.7% had stayed in the ICU.

Variable	**SSI Incidence n = 60**
Preoperative hospital stay	5 days
Type of intervention	
Organ operated	
Colorectal surgery	28 (46.6%)
Hepatic surgery	2 (3.3%)
Hernia and eventration	6 (10%)
Small bowel surgery	15 (25%)
Gastroduodenal surgery	3 (5%)
Pancreatic surgery	4 (6.6%)
Other	2 (3.3%)
Surgical approach	
Laparoscopy	0 (0%)
Laparotomy	60 (100%)
Contamination class	
Clean (Class 1)	12 (20%)
Clean-contaminated (Class 2)	45 (75%)
Contaminated (Class 3)	3 (5%)
Dirty (Class 4)	0
Stoma	22 (36.7%)
ICU stay	31 (51.7%)

83.3% of infections were diagnosed during hospitalization. The 60 infected patients underwent bacteriological sampling.
The organisms found in infected patients were: *Escherichia coli* (27 cases) 46.7%, *Klebsiella pneumoniae* (8 cases) 13.3%, *Enterobacter cloacae* (7 cases) 11.6%.

Bacterium involved	**Frequency**
Escherichia coli	27 (46.7%)
Klebsiella pneumoniae	8 (13.3%)
Enterobacter cloacae	7 (11.6%)

Postoperative stays for infected patients ranged from 5 to 39 days, with an average of 14 days.

DISCUSSION

SSIs are among the most common postoperative complications and a costly, yet potentially preventable, cause of morbidity and mortality(5).
Among surgical specialties, colorectal surgery has one of the highest SSI rates, ranging from 15% to 30%(6).
In our study, the incidence of SSIs was 2.46%, which aligns with data from the literature , the Spicimi study in France (2.45%) (4) and the Carvalho study in Brazil (3.4%) (5).
Many studies have investigated the causes and risk factors of SSIs (7).

Among these, the ASA score is noteworthy, it's a classification system developed by the American Society of Anesthesiologists over 60 years ago to evaluate a patient's preoperative physical status (8).
Our study and others have shown a rising risk gradient from ASA 1 to ASA 4, and that ASA ≥ 3 is associated with an increased risk of SSI (7-9).
Regarding diabetes, numerous studies confirm a higher frequency of SSIs among diabetic patients, who are nearly twice as likely to develop an SSI as non-diabetics (7-10).
In our study, the SSI rate was higher among patients with IBD, possibly due to cachexia, malnutrition, and the fact that surgeries in such patients are often contaminated, with an increased risk of stoma placement (11).
The infectious risk is also higher when preoperative hospitalization is prolonged due to changes in skin and digestive flora and the replacement of endogenous bacteria by more resistant pathogens (12), which in turn lengthens hospitalization.
In our study, most SSIs occurred after colorectal surgeries, which are typically classified as contaminated or clean-contaminated. Nonetheless, even clean surgeries are not exempt, 10% of infected patients had undergone hernia or eventration repair.
According to several studies, the presence of a stoma is a risk factor for SSI(13) . In our study, 36.7% of infected patients had a stoma.
A 2023 meta-analysis found that SSI risk in patients with a hospital stoma was 1.89 times higher(13).
This can be explained by the patient's lack of education regarding autonomous stoma care hence the need for a stoma care nurse (stomatherapist).
In this study, the responsible bacteria were mainly Gram-negative bacilli, with a high proportion of enterobacteria, *E. coli* being the primary one, which aligns with literature data.
The Spicimi network for the year 2020 reported similar findings, with Escherichia coli predominating at 22.2%, followed by Enterococcus faecalis and Staphylococcus aureus at 19.4% and 8.3%, respectively (4).

RECOMMENDATIONS

Several recommendations can be made to prevent SSIs in our institution:

- Implementation of a national protocol for SSI surveillance.
- Training of medical and paramedical staff in SSI prevention.
- Equipping hospitals with adequate care equipment.
- Compliance with hygiene and aseptic measures.
- Educating patients about the importance of SSI monitoring.
- Hospitalizing patients the day before or on the day of surgery.
- Ceasing systematic bowel preparation.
- Ceasing systematic hair removal.
- Stopping systematic antibiotic prophylaxis for Altemeier Class I surgeries.
- Favoring laparoscopy in surgical procedures.
- Rigorous control of operating room equipment.
- Proper stoma appliance fitting.
- Irrigation of the wound before closure.
- Performing an antibiogram before any curative antibiotic therapy.
- Informing each patient of infectious risks and preventive measures prior to discharge.

CONCLUSION

Surgical site infections remain a significant challenge within surgical practice, representing a major cause of postoperative morbidity and an avoidable burden on both healthcare systems and patients. The experience of our general surgery department highlights an incidence of 2.46%, consistent with international data, and emphasizes the predominance of colorectal procedures as a key source of infection. Several modifiable and non-modifiable risk factors have been identified, including patient comorbidities such as diabetes and inflammatory bowel disease, as well as operative factors like the type of surgery and contamination class.
These findings underscore the urgent need for a comprehensive and proactive prevention strategy. Strengthening infection surveillance protocols, reinforcing staff training, and promoting evidence-based perioperative practices are essential steps toward reducing SSIs. Furthermore, the rational use of antibiotics and favoring minimally invasive techniques when feasible should become standard practice.
Ultimately, improving patient outcomes and reducing the burden of SSIs will require a multidisciplinary commitment to infection control and a culture of safety that spans all levels of the surgical care pathway.

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