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## Bacteriological profile of surgical site infections and their antibiogram

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### Abstract

Surgical site infection (SSI) is one of the most common postoperative complications that is encountered in the clinical and surgical practice and it is also the most important cause of significant postoperative morbidity and mortality. The study puts in an effort to determine the incidence of surgical site infections in clean, clean contaminated and contaminated surgeries in our setting along with the factors related to patient and surgical procedures influencing the rate of postoperative surgical wound infections and determine bacteriological profile with antimicrobial susceptibility patterns of the isolates.

**Keywords:** surgical site infection, antibiogram, cross sectional study

### Introduction

Approximately 27 million surgical procedures are performed in the United States each year, with up to 5% resulting in surgical site infections (SSI). Trends in the incidence of SSI are monitored by the National Nosocomial Infections Surveillance (NNIS) system of the Centers for Disease Control and Prevention (CDC). According to NNIS data, SSIs are the third most frequently reported nosocomial infection and are associated with substantial morbidity that can endanger a patient's life, increase the number of days in the hospital, and increase healthcare costs. Surgical site infections are defined as infections that occur 30 days after surgery with no implant, or within 1 year if an implant is placed and infection appears to be related to surgery. Infections are classified as either incisional or organ/space infections to differentiate those that occur at the incision site from those related to the organ or space manipulated during surgery. Incisional infections are further classified as superficial or deep. In the United States, the incidence of SSI is tracked by the National Nosocomial Infections Surveillance (NNIS) system and the National Hospital Discharge Survey, both sponsored by the CDC. The American Hospital Association also compiles statistics through an annual survey. A study by using all of these data sources determined that 244,385 SSIs were reported in U.S. hospitals in 2002, accounting for 20% of all healthcare-associated infections and nearly 2% of all monitored surgical procedures. Surgical site infections are associated with substantial morbidity and mortality. Patients with SSI are twice as likely to die, 60% more likely to be admitted to the intensive care unit, and more than five times more likely to be readmitted to the hospital after discharge. In 2002, SSIs contributed to 8205 deaths. Occurrence of SSI is estimated to increase hospital stay by 7 to 10 days and add over \$3,000 in costs of care. In a comparison study (Kirkland KB, 1999)<sup>[3]</sup> of surgical patients with vs. without infection, the median direct costs of hospitalization were almost double for infected patients. Patients who were readmitted after discharge incurred higher costs.

### Aims and Objectives

To study the bacteriological profile of surgical site infections and their antibiogram

### Materials and Methods

Thirty cases were studied in the Department of General Surgery, Kanachur Institute of Medical Sciences.

The samples were collected in the form of blood, pus, sputum and urine.

They were sent to the Department of Microbiology for culture and sensitivity.

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**Inclusion criteria**

All were operated cases

**Exclusion criteria**

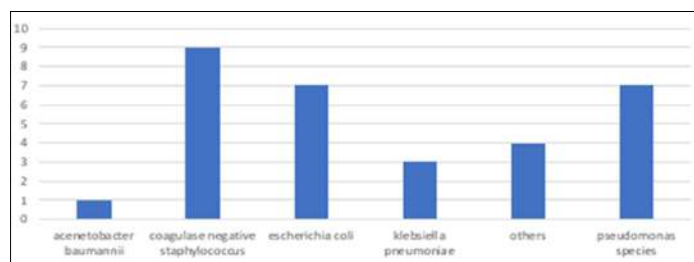
Patients on chemo or radio therapy.

All patients on immunodeficiency drugs and immunomodulators were not included for the study.

**Results**

**Table 1:** Sample Collected

Sample	
Pus	26
Blood	02
Urine	01
sputum	01



**Graph 1:** Culture

**Table 3:** Antibiogram

	P	EC	AB	K	CNS
Amikacin	5	10		4	
Gentamycin	5	11	2	4	2
Colistin	3				
Ceftazidime	3				
Cefepime	3				
Nalidixic Acid				2	
Ciprofloxacin	2		1	3	1
Norfloxacin				3	
Levofloxacin	4		1		1
Nitrofurantoin		8		1	1
Fosfomycin		9		2	
Trimethoprim/Sulfamethoxazole		9	2	2	
Piperacillin/Tozabactam	4	2	1	2	
Ceftrazidime	2	6			
Ertapenem		1		2	
Minocyclin			1		
Tigecycline			1		
Amoxiclav		1	1	1	
Doripenem	2	1		1	
Meropenem	2	1		1	
Clindamycin					2
Linezolid					2
Teicoplanin					1
Vancomycin					1
Tetracycline					1
Oxacillin					1
Cefalotin				1	
Ceftazidime				1	
Cefexime				1	
Cefoperazone/Sulbactam				1	
Cefepime	2	6		1	
Cefoxitin		1			
Cotrimoxazole					1
Doxycyclin					1
Erythromycin					1
Ofloxacin				1	

**Discussion**

Surgical site infections may be caused by endogenous or exogenous microorganisms. Most SSIs are caused by endogenous microorganisms present on the patient’s skin when the surgical incision is made. Gram-positive bacteria such as Staphylococcus aureus are the most common causative skin-dwelling microorganisms. Surgical site infections may also be caused by organisms within the patient’s body that are exposed during surgery. Causative pathogens depend on surgical site; for example, the risk of developing SSI from enteric gram-negative microorganisms increases with surgery on the gastrointestinal tract. Exogenous sources of microorganisms include surgical instruments, operating room surfaces, the air, and personnel. The risk of SSI caused by resistant bacteria has become a major concern for hospitals and healthcare professionals. “Resistance” is the term used to describe the ability of a microorganism to withstand the effects of an antimicrobial agent. Microorganisms acquire resistance through evolution and adaptation. In particular, there is concern about the rise in SSIs due to vancomycin-resistant enterococci (VRE), Methicillin-resistant Staphylococcus aureus (MRSA), third generation cephalosporin-resistant Escherichia coli, and imipenem- and quinolone-resistant Pseudomonas aeruginosa. The development of resistant microorganisms can result in increased morbidity, mortality, and costs of care. For example, in one study the presence of MRSA in a surgical incision was associated with a 12-fold increase in 90-day postoperative mortality, compared with uninfected patients. Hospitalization stays for these patients increased a median of 5 days, and median costs of care were nearly twice higher for MRSA-infected patients compared with uninfected patients. Hospitalized patients with VRE had a 6% increased risk of mortality, 6.2 days of excess hospitalization, and in additional hospital costs, compared with uninfected patients. Hospital costs attributable to nosocomial infections caused by resistant bacteria have been conservatively estimated at 1.6 billion dollars per year in the United States.

Risk factors for developing SSI can be broadly grouped by patient, wound, and procedural variables. Patient variables that increase risks for SSI include the following:

- Very young or very old age
- Diabetes (especially increased HgA1c and glucose >200 mg/dL within 48 hours after surgery)
- Tobacco use
- Steroid use
- Compromised immune system
- Infection or colonization at a remote body site
- Obesity
- Poor nutritional status
- Length of preoperative stay (increases exposure to pathogens)
- Wound contamination

Antimicrobial prophylaxis (AMP) refers to a short course of antimicrobial therapy administered prior to surgery to reduce microbial counts to a level that will not overwhelm host immune response. Antimicrobial prophylaxis should be administered only for Class I and II wounds. Patients with Class III or IV wounds are presumed to be taking antimicrobial therapy already. Optimal AMP therapy requires:

- Use of the correct agent for the type of operation, based on clinical evidence
- Cephalosporin for coverage of most clean procedures due to its safety, broad-spectrum efficacy and low cost
- Appropriate timing of administration: 30 to 60 minutes prior to incision (i.e., enough time to reach

bactericidal serum and tissue concentrations); 1-2 hours for antibiotics with longer periods of infusion, such as vancomycin

Re-administration if surgery is delayed beyond 1 hour after the first AMP dose

Maintained at therapeutic levels in both serum and tissues throughout surgery

Lasting no longer than 24 hours after the end of surgery to reduce risk of developing resistance

A recent landmark study evaluated the rate of SSI in patients prepped preoperatively either with chlorhexidine gluconate plus alcohol solution or with povidone-iodine. In this randomized, controlled, multicenter trial, 897 patients undergoing clean-contaminated surgery were randomized to have their skin disinfected preoperatively with either 2% chlorhexidine gluconate/70% isopropyl alcohol (CHG/IPA) or 10% povidone-iodine. The primary endpoint was the occurrence of any SSI within 30 days after surgery. The occurrence of individual types of SSI was a secondary endpoint. Surgeons were unblinded, whereas patients and investigators who diagnosed SSI were blinded to the antiseptic product used.

Patients were contacted weekly following discharge, up to 30 days post-procedure. If SSI was diagnosed or suspected, cultures were taken to confirm the presence of microorganisms. The overall rate of infection was significantly lower in patients prepped with CHG/IPA (9.5%) compared to those prepped with povidone-iodine (16.1%,  $P=0.004$ ). The risk of SSI was reduced 41% for patients prepped with CHG/IPA compared to those whose skin was disinfected with povidone-iodine. There were also significantly fewer superficial incisional and deep incisional infections in the CHG/IPA arm.

### Conclusion

The bacteriological profile of surgical site infections and their antibiogram has been successfully studied. This study is intended to help a budding surgeon to understand and treat the SSIs very efficiently.

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