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***Original Research Article***

# Bacteriological profile and antibiogram of surgical site infections in a tertiary care center

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*Abstract*: ***Background:*** Surgical Site Infections (SSI) remain a major cause of postoperative morbidity and mortality worldwide. They arise from both endogenous and exogenous sources, with incidence influenced by host factors, microbial burden, and surgical conditions. **Objective:** This study aimed to identify the bacteriological profile of postoperative wound infections and determine the antibiotic susceptibility patterns of Gram-positive and Gram-negative isolates. ***Methods:*** A retrospective study was conducted at ACS Medical College and Hospital, Chennai, from September 2024 to September 2025. A total of 100 clinical samples from postoperative wound infection patients were analyzed. Direct microscopy (Gram staining), bacterial culture on Blood Agar, Chocolate Agar, and MacConkey's Agar, and biochemical identification were performed. Antibiotic susceptibility testing was carried out using the Kirby-Bauer disk diffusion method according to CLSI guidelines. ***Results***: Out of 100 samples, 54 (54%) were culture positive, with a higher prevalence in females (54%) and elderly patients (>50 years, 54%). Gram-negative isolates predominated (74%), with Escherichia coli (38%) being the most frequent pathogen. Among Gram-positive bacteria, Staphylococcus aureus (11%) was most common. Ampicillin-Sulbactam, Linezolid, and Levofloxacin were most effective against Gram-positive isolates, while Gentamycin and Amikacin showed highest efficacy against Gram-negative isolates. Ciprofloxacin and Cefuroxime were the least effective agents. ***Conclusion:*** The study highlights the predominance of Gram-negative bacteria, particularly E. coli, in SSI. Continuous microbiological surveillance and adherence to antimicrobial stewardship are essential to combat rising resistance trends and improve patient outcomes.

*Keywords*: Surgical Site Infection; Postoperative wound infection; Gram-negative bacteria; Escherichia coli; Staphylococcus aureus; Antibiotic susceptibility; Antimicrobial resistance; Kirby-Bauer method; Nosocomial infection; Chennai

## INTRODUCTION

Infection is defined as the invasion and multiplication of microorganisms in body tissue, representing a major clinical challenge (1). In surgical patients, the inevitable impairment of the host's first line of defence is the skin—during an operation exposes the internal environment to microbes, resulting in Surgical Site Infections (SSI) (2). A wound offers a moist, warm, and nutritive environment conducive to microbial proliferation (3). The probability of infection depends on the balance between the patient's systemic host defences, local wound conditions, and microbial burden (2). Postoperative wound infections are a primary cause of morbidity and mortality. They can arise from Exogenous sources like environment, staff, instruments or Endogenous sources like the patient's own flora. SSI, also called postoperative infection, is defined as an infection occurring at the surgical site within 30 days of surgery or 90 days for certain implant-related procedures. In India, SSI is the third most frequently reported nosocomial infection, associated with substantial morbidity (2). Globally, SSI rates range widely, with reports of 2.5% to 41.9% (3). In India, reported rates fall between 4-11 per 100 surgeries. The development of SSI is determined by three main factors: the degree of microbial contamination, the duration of the procedure, and host factors such as advanced age, diabetes, and immune suppression. The etiological agents of SSI are varied and depend on the site of surgery and the source of infection (4). Skin: Staphylococcus aureus (most common overall) and Coagulase-Negative Staphylococci (CONS). Mucosa (GIT, genitourinary): Aerobic Gram-negative bacilli (E. coli, Klebsiella), Gram-positive cocci (Enterococcus), and anaerobes (Bacteroides) (5). The risk of SSI is proportional to the Inoculum of bacteria and the Virulence of bacteria (6). The present study focused on identifying the Gram-positive and Gram-negative bacteria and to determine the antibiotic susceptibility pattern of post-operative wound infections.

## MATERIAL AND METHODS

This retrospective study was carried out over a period of September 2024 – September 2025 for 100 clinical samples from post operative wound infection patients, at ACS Medical college and hospital, chennai. Ethical approval was procured by the institutional ethics committee of ACS Medical College and Hospital.

Direct Microscopy (Gram Staining)

A smear was prepared, stained, and examined under an oil immersion.

**Bacterial Culture**

Samples were plated directly onto solid media Blood Agar, Chocolate Agar, and MacConkey's Agar. The plates were incubated aerobically at 37°C for 24 hours. Bacterial isolates were identified based on colony morphology, Gram staining, and standard biochemical reactions.

**Antibiotic Susceptibility Testing**

AST was performed using the Kirby-Bauer disk diffusion method according to Clinical and Laboratory Standards Institute (CLSI) guidelines. The inoculum was standardized to the turbidity of a 0.5 McFarland Standard and streaked onto sterile Mueller-Hinton Agar plates.

## RESULTS

**Culture Positivity and Demographics**

Out of the 100 total cases screened, 54 samples were found to be culture positive. A higher number of positive cultures were observed in females (54%). Depicted in table 1.

**Table 1:**

| GENDER | COUNT | PERCENTAGE |
|---|---|---|
| MALE | 25 | 46% |
| FEMALE | 29 | 54% |

The highest rate of positive cultures (54%) was seen in elderly people (>50 years) table 2.

**Table 2:**

| AGE GROUP (YEARS) | | NUMBER OF PATIENTS | PERCENTAGE (%) |
|---|---|---|---|
| CHILDREN | (1-17) | 05 | 9 |
| ADULT | (18-30) | 07 | 13 |
| | (31-50) | 13 | 24 |
| ELDERLY | (>50) | 29 | 54 |

**BACTERIOLOGICAL PROFILE**

A total of 54 bacteria were isolated from the 54 positive samples. Table 3.**Table 3:**

| Organism Category | Total Isolates | Percentage (%) |
|---|---|---|
| Gram Positive | 14 | 26 |
| Gram Negative | 40 | 74 |

Gram-negative isolates were clearly predominant (74%). The most frequently isolated organism overall was the Gram-negative *E. coli* (38%). *Staphylococcus aureus* was the most common Gram-positive isolate (11%). Table 4.

**Table 4.** Distribution of Specific Bacterial Isolates

| Organism Detected | Number of Isolates | Percentage (%) of Total Isolates (54) |
|---|---|---|
| *Escherichia coli* | 20 | 38 |
| *Staphylococcus aureus* | 6 | 11 |
| *Klebsiella species* | 6 | 11 |
| *Acinetobacter species* | 5 | 9 |
| *Proteus species* | 4 | 7 |
| *Coagulase negative Staphylococcus (CONS)* | 4 | 7 |
| *Enterococcus species* | 4 | 7 |

 

| | | |
|---|---|---|
| *Pseudomonas aeruginosa species* | 3 | 6 |
| Enterobacter species | 2 | 4 |
| TOTAL | 54 | 100 |

**ANTIBIOGRAM (ANTIBIOTIC SUSCEPTIBILITY PATTERN)**

Gram-Positive Bacteria most Effective: Ampicillin-Sulbactam, followed by Linezolid and Levofloxacin. Least Effective: Ciprofloxacin. *Staphylococcus aureus* specific: Most effective was Ampicillin-Sulbactam; least effective was Ciprofloxacin. Gram-Negative bacteria: Overall Most Effective: Gentamycin. Over all least Effective: Cefuroxime. *E. coli* specific: Most effective was Gentamycin, followed by Amikacin. *Pseudomonas* species specific: Most effective was Ceftazidime; least effective was Cefuroxime.

## DISCUSSION

This study confirms the ongoing relevance of SSI surveillance in our setup by detailing the incidence, bacteriological profile, and antibiogram (1). The highest rate of infection (54%) in elderly people (>50 years) is consistent with known risk factors, as advanced age often correlates with immunosuppression and underlying disease states (7). Our findings indicate a clear dominance of Gram-negative isolates (74%) over Gram-positive isolates (26%), a trend increasingly reported in modern nosocomial settings (8, 9). The most frequent isolate was the Gram-negative E. coli (38%), which is a key pathogen in procedures involving visceral entry (10). Among Gram-positive bacteria, S. aureus (11%) was the most common, derived from the patient's own skin flora (12). Gram-Positive Efficacy: Ampicillin-Sulbactam was the most effective agent, suggesting its continued value. However, the low efficacy of Ciprofloxacin against Gram-positive isolates is concerning and may reflect increasing fluoroquinolone resistance (13). Gram-Negative Efficacy: Gentamycin was the most effective antibiotic overall and for E. coli, supporting the use of aminoglycosides in empirical treatment. The poor performance of Cefuroxime (least effective) against Gram-negative organisms and Pseudomonas suggests high rates of beta-lactamase or ESBL production (14).

## CONCLUSION

The spectrum of bacteria involved in SSI shows a current dominance of Gram-negative isolates, led by E. coli, with S. aureus being the most common Gram-positive pathogen. Ampicillin-Sulbactam, Linezolid, and Levofloxacin were effective for Gram-positive bacteria, while Gentamycin and Amikacin were most effective against Gram-negative bacteria. The observed resistance patterns necessitate continuous microbiological surveillance and strict adherence to antimicrobial stewardship programs.

**DECLARATION:**

Declarations:

Acknowledgment:

All the listed authors are thankfull to their respective universities/institution for supporting this study

Conflict of Interest

The authors declare that there is no conflict of interest.

**Authors' Contribution**

All authors listed in this study have made a substantial direct and intellectual contribution to the work and approved it for publication

Funding

None.

Ethics Statement

Ethical approval was procured by the institutional ethics committee of ACS Medical College and Hospital. No personal identifiers, and patient confidentiality were maintained throughout the study.

**Data Availability**

All dataset generated during the study are included in the manuscript.

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