ISSN: 0975-3583, 0976-2833 VOL15, ISSUE2, 2024

Original Research Article

MICROBIAL PROFILING AND ANTIBIOGRAM OF CAESAREAN SECTION SURGICAL SITE INFECTIONS AT A TERTIARY CARE CENTRE

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Abstract

Background & Methods: Surgical site infections (SSIs) are the second most common healthcare associated infections (HAI) reported after Catheter associated urinary tract infections (CAUTI), putting significant burden on healthcare system, also contributes to increased morbidity and negative impact on the psychological, social and economic aspect of patients' life. The aim of the study is to study surgical site infection after caesarean section- Bacteriological profile and Antibiogram. Samples were collected under strict aseptic precautions using sterile cotton swabs from patients and were processed as per standard microbiological techniques.

Results: Out of 150 patients who underwent caesarean section, 17 were found to have SSIs. Staphylococcus aureus (MRSA)- 06(35.3%) was most common bacterial species isolated followed by Enterococcus spp.- 04(23.5%), Klebsiella pneumoniae-03 (17.6%), Escherichia coli-02 (11.8%) and Pseudomonas aeruginosa-02 (11.8%). Antimicrobial profile of Gram positive isolates revealed maximum sensitivity to linezolid, whereas among Gram negative isolates meropenem, amikacin, gentamicin were found to be most sensitive for Enterobacterales.

Conclusion: To conclude, there is predominance of Gram positive organisms and emergence of MDR Gram negative organisms. By adhering to strict infection control practices, meticulous operative technique, timely administration of appropriate preoperative antibiotics, optimal preoperative, intra-operative and postoperative patient care will aid in reducing the incidence of SSIs.

Keywords: Surgical site infections(SSIs), Caesarean section, Microbiological profile, Antimicrobial Resistance

Study Design: Observational Study.

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1. Introduction

Infections of surgical wounds are called surgical site infections (SSIs) [1]. SSIs are defined as infections occurring within 30 days after surgery or within 90 days for some surgeries such as joint surgeries including implants, cardiac procedure [2]. According to the National Nosocomial Infection Surveillance Program (NNIS), it is classified into superficial, deep, and organ/space infections [3]. Sources of SSIs include the patient's own normal flora, organisms present in the hospital environment that are introduced into the patient by medical procedures, specific underlying diseases, trauma, that may cause a mucosal or skin surface interruption [4]. SSIs are serious operative complications that occur in approximately 2% of surgical procedures and account for 20% of healthcare-associated infections. Many studies have reported that SSIs rank second among common nosocomial infections, next to the urinary tract infections [5] [6]. Recent studies reported that the SSI rate ranges from 19.4% to 36.5% all over the world, whereas it ranges from 3% to 12% in India. One frequently isolated pathogen in SSI is Staphylococcus aureus. Gram negative bacilli, Pseudomonas aeruginosa, Klebsiella, and Escherichia coli are among the other organisms that are frequently isolated from SSIs [7].

The management of surgical site infections (SSIs) has advanced with the introduction of antibiotic prophylaxis, use of barriers, enhanced operating room ventilation, and sterilisation procedures. But SSIs continue to happen and contributes to significant morbidity and mortality, prolonged hospital stays, and consequently increases healthcare costs. Multiple vaginal examinations, prolonged labour prior to caesarean section, prolonged rupture of membranes, emergency caesarean section, unbooked status, and obstructed labour are among the reported risk factors for caesarean section wound infection [8]. The development of a postoperative wound infection depends on the complex interplay of many factors. For most postoperative wounds, the source of infection is endogenous. Exogenous infections are mainly acquired from the nose or skin flora of the healthcare workers and transmitted through the hands of the surgeon or improper operation theatre sterilization, which includes preoperative, intraoperative, and postoperative care [8]. Some significant factors that can influence the incidence of subsequent infection are surgical techniques, skin preparation, timing, the method of wound closure, and antibiotic prophylaxis. Prolonged wound healing, wound dehiscence, ruptured abdomen are among the complications associated with SSIs. Additional risks include an extended hospital stay, an extended antibiotic course, the potential for readmission, secondary repair surgery, incisional hernias, scars, and in rare cases, fatalities from severe sepsis [8]. Infections at the surgical site also negatively impact one's physical, psychological, social, and financial well-being.

2. Material and Methods

This is an observational study conducted in the Department of Microbiology ABVGMC, Vidisha for a duration of 6 months. A total of 150 patients who presented in the Department of Obstetrics and Gynecology during study period who underwent caesarean section and gave their consent were included in the study. And followed for 30 days post caesarean section.

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE2, 2024

Under aseptic precautions, using sterile cotton swab sticks samples were collected and placed into sterile container filled with sterile saline, and transported to Microbiology Laboratory at the earliest. Samples were than processed according to Standard Microbiological Techniques. Antimicrobial Susceptibility Testing was done by Modified Kirby-bauer disk diffusion method as Clinical and Laboratory Standards Institute (CLSI) guidelines.

Exclusion criteria

1. Incomplete or mismatched case referral form (CRF)
2. Dry wound swab
3. Surgical site infection occurring after 30 days of surgery

3. Result

Figure1: Shows that out of 150 sample collected from participants, 17 (11.3 %) had surgical site infection following caesarean section.

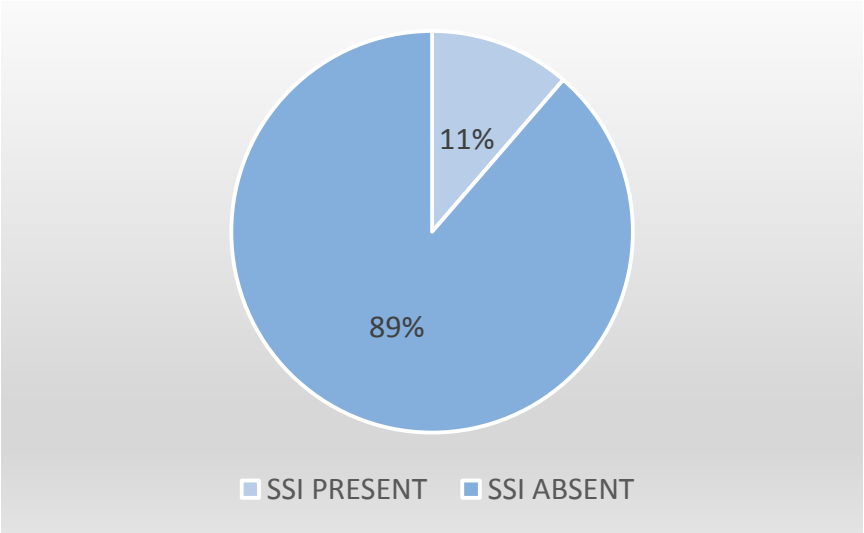
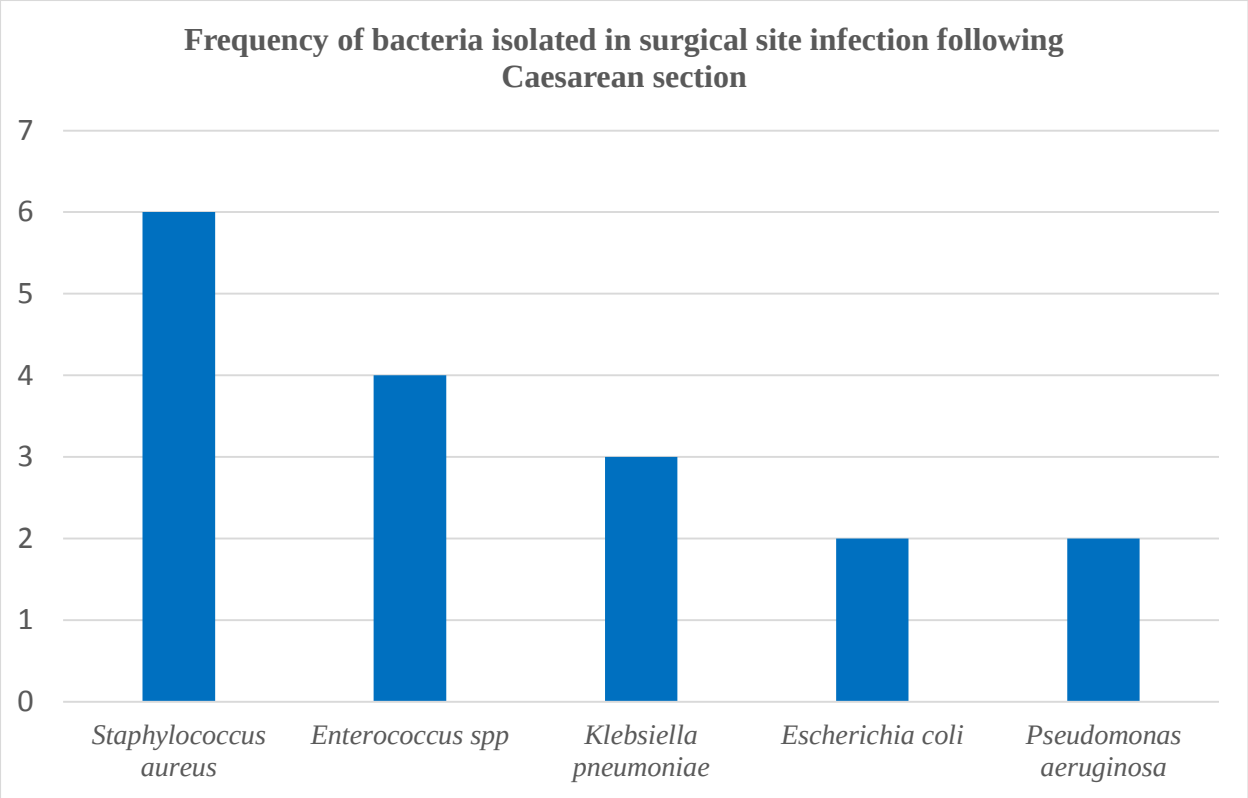


Figure2: Shows frequency of bacteria isolated in case of Surgical site infection following Caesarean section

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE2, 2024



Out of 150 samples, 133 (88.7%) showed no bacterial growth, whereas 17 (11.3%) showed positive growth of micro-organism. Out of 17 culture positive cases 10 (58.8%) were Gram positive cocci and 07 (41.2%) Gram negative bacilli. Staphylococcus aureus (MRSA)- 06 (35.3%) was most common bacterial species isolated followed by Enterococcus spp.- 04 (23.5%). Other species isolated were Escherichia coli, Klebsiella pneumoniae and Pseudomonas aeruginosa.

Table1: Antimicrobial susceptibility pattern (Resistance %) of Gram positive strains isolated in case of Surgical site infection following Caesarean-section

Antibiotics	**Staphylococcus aureus (MRSA) n=06 (%)**	**Enterococcus spp. N=04 (%)**
Clindamycin	04 (66.6)	N/T
Doxycycline	02 (33.3)	03 (75)
Gentamicin	03 (50)	N/T
Cotrimoxazole	04 (66.6)	N/T
Azithromycin	02 (33.3)	04 (100)
Ciprofloxacin	02 (33.3)	04 (100)
Vancomycin	01(16.6)	04 (100)
Linezolid	01(16.6)	01 (25)
Cefoxitin	06 (100)	N/T

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Among Gram positive isolates**,** Staphylococcus aureus (MRSA) was most sensitive to linezolid and vancomycin. Antibiotics like Cefoxitin-06(100%), Clindamycin-04(66.6%), Cotrimoxazole-04(66.6%) showed resistivity for Staphylococcus aureus (MRSA). Most sensitive drug for Enterococcus spp. was linezolid. Azithromycin, Ciprofloxacin, Vancomycin were 100% resistive antibiotics against Enterococcus spp.

Table2: Antimicrobial susceptibility pattern (Resistance %) of Gram negative strains isolated in case of Surgical site infection following Caesarean-section

Antimicrobials	**Escherichia coli n=02 (%)**	**Klebsiella pneumoniae n=03 (%)**	**Pseudomonas aeruginosa n=02 (%)**
Amikacin	0	03 (100)	01(50)
Ciprofloxacin	02 (100)	03 (100)	01 (50)
Gentamicin	0	03 (100)	01 (50)
Piperacillin-tazobactam	02 (100)	03 (100)	02 (100)
Ceftazidime	N/T	N/T	02 (100)
Meropenem	0	03 (100)	01(50)
Ceftriaxone	02 (100)	03 (100)	N/T

Note: N/T (Not Tested)

Among Gram negative isolates Amikacin, Gentamicin and Meropenem were 100% sensitive and 100% resistant for Escherichia coli and Klebsiella pneumoniae respectively, whereas Piperacillin-tazobactam and Cephalosporins showed 100% resistivity to both Enterobacterales and Pseudomonas aeruginosa. Antimicrobial ciprofloxacin shows variable resistance pattern across Gram negative isolates.

4. Discussion

Among patients undergoing surgery, postoperative SSIs continues to be one of the major causes of morbidity. Our study provides information on the sensitivity profiles of the microorganisms responsible for post-operative wound infections at our hospital. The incidence of surgical site infection following caesarean section in our study was 11.3% which is similar to study conducted by ezemir R et al., 2023 [9]. Various other studies have reported varying incidence rate of SSIs. Various indications for caesarean sections performed in different centres, population studied, and risk factors for surgical site infections that are common in the institution could be the cause of variability in these studies. A complicated web of interrelated factors can lead to the development of a postoperative wound infection which include repeated vaginal examination, extended labour before emergency caesarean section, prolonged rupture of the membranes, unbooked status, obstructed labour, prolonged hospital stays [6-7]. Factors like commensal flora of the healthcare workers, sterilisation method of operation theatre, preoperative, intraoperative, and postoperative care, surgical techniques, skin preparation, timing, method and technique of wound closure, and

ISSN: 0975-3583, 0976-2833 VOL15, ISSUE2, 2024

prophylactic antibiotic therapy also contribute significantly, Allegranzi B et al., 2011; R et al., 2023 [8-9]. Complications such as delayed wound healing, endometritis, sepsis, abscess formation, pelvic inflammatory disease (PID), wound dehiscence, impact on breast feeding adds on to put negative impact on psychological, social and financial well-being of the patient. In our study there is predominance of Gram positive organism 10 (58.8%) as compared to Gram negative 07 (41.2%) which is in agreement with studies conducted by Choudhury N et al., 2021; ezemir R et al., 2023; Thakur N et al., 2021[7,9,11]. Staphylococcus aureus (MRSA)- 06 (35.3%) was most common bacterial species isolated followed by Enterococcus spp., Escherichia coli, Klebsiella pneumoniae and Pseudomonas aeruginosa; studies by Choudhury N et al., 2021, Thakur N et al., 2021[7,11] have also reported similar findings. In our study most sensitive antimicrobials for Gram positive isolates was linezolid and azithromycin and ciprofloxacin showed variable resistance pattern. For Gram negative isolates amikacin, gentamicin and meropenem were 100% sensitive and 100% resistance for Escherichia coli and Klebsiella pneumoniae respectively, whereas Piperacillin-tazobactam and Cephalosporins showed 100% resistivity to both Enterobacterales and Pseudomonas aeruginosa. This findings of antimicrobial susceptibility pattern for micro-organisms isolated in our study are more or less in agreement with findings of other studies [6,7] [10,11]. Thus our study emphasize on preventing SSIs is crucial for ensuring the health and well-being of the mother. Several measures such as preoperative antibiotic prophylaxis, proper hand hygiene and antiseptic techniques during surgery, maintaining normothermia, minimizing tissue trauma, using sterile instruments and equipment, and optimizing postoperative wound care contributes significantly in decreasing the risk of SSIs. Additionally, educating both healthcare workers and patients about the importance of infection control practices can further enhance the effectiveness of these measures, thus reducing the incidence of SSIs and promoting better outcome for mothers and the infants.

5. Conclusion

To conclude, there is predominance of Gram positive organisms and emergence of multi drug resistance (MDR) Gram negative organisms. By adhering to strict infection control practices, meticulous operative technique, timely administration of appropriate preoperative antibiotics, optimal preoperative, intra-operative and postoperative patient care as well as strengthening the available antimicrobial stewardship program will aid in reducing the incidence of SSIs.

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