Section: Obstetrics and Gynaecology

Original Research Article

INCIDENCE OF SURGICAL SITE INFECTION, BACTERIAL ISOLATE AND THEIR ANTIMICROBIAL SUSCEPTIBILITY PATTERN IN TERTIARY CARE CENTER AMBIKAPUR

Subrata Das[1], Swapnil Wilson[2], Avinashi Kujur[3], Yogita Patel[4]

[1]Associate Professor, Department of Obstetrics and Gynaecology, RSDKS Government Medical College and Hospital, Ambikapur Surguja, Chattisgarh, India.
[2]Assistant Professor, Department of Obstetrics and Gynaecology, RSDKS Government Medical College & Hospital, Ambikapur Surguja, Chattisgarh, India.
[3]Professor and Hod, Department of Obstetrics and Gynaecology, RSDKS Government Medical College and Hospital, Ambikapur Surguja, Chattisgarh, India.
[3]PGT, Department of Obstetrics and Gynaecology, RSDKS Medical College and Hospital, Ambikapur Surguja, Chattisgarh, India.

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Corresponding Author:
Dr. Subrata Das
Email: ishaanjipmer@gmail.com

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Abstract

Background: One of the most frequent complications for patients undergoing caesarean sections is postoperative surgical site infection (SSI), which is also the third most common nosocomial infection in hospital patients. The aim is to evaluate incidence of surgical site infection, bacterial isolate and their antimicrobial susceptibility pattern in tertiary care center Ambikapur. **Materials and Methods:** This retrospective study was conducted at the Department of Obstetrics and Gynecology at RSDKS Government Medical College in Ambikapur. Patients who underwent cesarean sections and were then monitored to identify those who experienced surgical site infections following the procedure made up the study population. Using sterile swab sticks, wound swabs were extracted from the infection site for microbiologic culture. The wound was then washed with an antiseptic solution to prevent skin commensals from contaminating it, and it was promptly transported to the hospital laboratory for microscopic, culture, and sensitivity testing. **Result:** In this study total 623 patients were evaluated during the 6 months duration retrospectively. Out of this, 50 patients were found to suffer from SSI. The overall percent of patients with SSI was 8.72%. The frequency of Staphylococcus aureus being isolated from post operative wound was maximum accounting for 18 (40.90%) patients. It was followed by Klebseilla being isolated from 12 (27.26%) patients.The frequency of Pseudomonas aeruginosa bacteria being isolated from post operative wound infection was 8 (18.18%). The frequency of Proteus spp bacteria being isolated from post operative wound infection was 8 (18.18%). It was observed that Staph aureus was having resistance against antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, Gentamycin, Levofloxacin, ciprofloxacin, Amoxicillin/clavulananic acid. While it was highly sensitive to antibiotics like Amikacin, Imipenem, Cefipime, Cefoxitin. It was moderately sensistive to erythromycin and clindamycin. It was observed that Klebseilla species was highly resistant to antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, gentamycin, Amoxicillin/clavulananic acid, Meropenem and Cefipime (100%). It was observed that Klebseilla species was sensitive to antibiotics like Amikacin, Levofloxacin, Ciprofloxacin and Imipenem. **Conclusion:** The overall percent of patients with SSI was 8.72%. The most frequently isolated bacteria from post-caesarean wound infections were Staphylococcus aureus and Klebsiella. Imipenem and amikacin showed least resistance to most frequently isolated bacteria from post-caesarean wound infections, therefore they can be used as the first line antibiotics empirically to treat post-caesarean wound infections with.

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INTRODUCTION

An infection that affects the incision or deep tissues at the operation site and manifests within 30 days following a surgical procedure is referred to as a surgical site infection. These infections could involve organs or bodily spaces, or they could be superficial or profound incisional infections.[1-3] One of the most frequent issues for patients undergoing caesarean sections is postoperative surgical site infection (SSI), which is also the third most common nosocomial infection in hospital patients.[4-6] Following a caesarean section, postoperative SSI is linked to higher rates of morbidity, death, extended hospital stays, secondary infertility, and higher patient care expenses.[7-10]

There are significant differences in the prevalence of postoperative SSI among operations, hospitals, surgeons, patients, and geographic areas. 2.85% in India, 21% in Ethiopia, and 7-9.6% in Nigeria, are all complicated by it.[11-15] 20–30% of hospitalized SSIs are caused by Staphylococcus aureus, a frequently isolated bacterium in SSI.[12-16] Gram-negative bacilli, Pseudomonas aeruginosa, and Escherichia coli are among the other species that are frequently recovered from SSIs.[17-21] Klebsiella as well as Improved operating room ventilation, sterilization techniques, barrier use, surgical techniques, and the availability of antimicrobial prophylaxis are some examples of advances in SSI control strategies. In spite of this, SSIs continue to be prevalent causes of hospital-associated morbidity and mortality, mostly in developing nations.[14-18]

The increasing number of harmful microorganisms that are resistant to antibiotics is one factor contributing to this.[19-23] Emergency caesarean sections, protracted labor before caesarean sections, prolonged rupture of membranes, repeated vaginal inspections, unbooked status, and prolonged obstructed labor are among the documented risk factors for caesarean section wound infection.[24-26] Additional contributing factors include the surgeon's incompetence or poor technique, extended operating time, protracted obstructed labor, postoperative anemia, high body mass index, diabetes mellitus, immunosuppressive conditions, and certain drugs, such as steroids.[27-29] Additionally, due to a lack of compliance with infection prevention and control procedures in the operating room, the rate of surgical infections is higher in our setting.

Unfiltered air, antiseptic solutions, patient transportation, the surgical team, crowded theatres, unclean environments, contaminated surfaces, and poorly sterilised equipment are all potential sources of infection.[30-32] Prolonged wound healing, wound dehiscence, wound discomfort, abdominal rupture, necrotizing fasciitis, and pelvic abscess are among the complications associated with SSIs. Additional risks include extended hospitalization, an extended antibiotic regimen, the potential for readmission, secondary repair surgery, incisional hernias, disfiguring scars, and in rare cases, the potential for severe sepsis and death.[33-34] Infections at the surgical site also negatively impact one's physical, mental, social, and financial well-being. Since no such study has been conducted at our center on cesarean sections, we do not know the common organisms causing infection following caesarean sections in our department or their sensitivity patterns.

Furthermore, not much study has been done on the role anaerobes play in the aetiology of SSIs in India. This disparity complicates the therapists' decision to use empirical therapy. In order to manage patients promptly and provide evidence-based, sensitive antibiotics that can be started as soon as a wound infection is discovered in our wards while we wait for the results of wound swab microscopy, culture, and sensitivity in 48–72 hours, it is crucial that we have a better understanding of the range of pathogens that cause SSI and their susceptibility pattern in our department. Such information would aid in the planning of surveillance and control of this category of diseases as well as the establishment of guidelines for the prevention and management of SSIs.

MATERIALS AND METHODS

This retrospective study was conducted at the Department of Obstetrics and Gynecology at RSDKS Government Medical College in Ambikapur. Patients who underwent cesarean sections and were then monitored to identify those who experienced surgical site infections following the procedure made up the study population. Women who had cesarean sections performed outside of our institution after a wound infection, had wound infections within 30 days of surgery, or refused to give their consent were excluded. The CDC's criteria were used to determine post-operative surgical site infection.[1] SSI categorization and timing were applied. SSI was categorized as an organ/space infection, deep incisional infection, or superficial infection.[1]

Infection signs and symptoms include pain, tenderness, localized swelling, or heat; purulent drainage from the superficial or deep incision, with or without laboratory confirmation; and organisms isolated from an aseptically obtained culture of fluid or tissue from the superficial or deep incision or organ/space. Purulent discharge from the drain that is inserted into the organ or space is also included. All eligible patients who had cesarean sections during the trial period and gave their consent to participate were included in the six-month study. Data from patients having cesarean sections was gathered using structured questionnaires.

Demographic information, past medical history, current drug use (such as steroids), smoking, and chronic diseases (such as diabetes mellitus and hypertension) are all included. The weight, height, and BMI were assessed through a physical examination. The caesarean section indication was recorded, and the patients were monitored to record

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the length of the procedure, any surgical problems, and the post-operative PCV. A physical examination was performed on the patients who acquired surgical site infections in order to diagnose and classify the infection. Using sterile swab sticks, wound swabs were extracted from the infection site for microbiologic culture. The wound was then washed with an antiseptic solution to prevent skin commensals from contaminating it, and it was promptly transported to the hospital laboratory for microscopic, culture, and sensitivity testing.

Statistical Analysis: SPSS version 22 was utilized for the analysis of the data. The Chi-square (χ^2) test was used for statistical comparison at a 95% confidence level and a significance level below 0.05.

RESULTS

In this study total 623 patients were evaluated during the 6 month duration retrospectively. Out of this, 50 patients were found to suffer from SSI. The overall percent of patients with SSI was 8.72%. [Table 1, Figure 1]. All the infections were reported within 30 days of surgery.

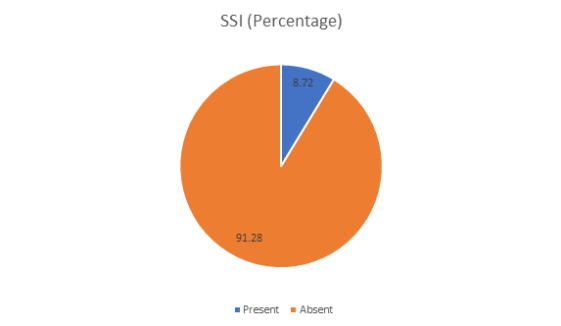

Figure 1: Percentages of patients with a wound infection after caesarean section

In 6 (12%) SSI patients, there was no growth of culture reported. 35 (70%) SSI patients were found to have monoisolates i.e growth of one bacteria while 9 (118.0%) patients were found to have multi-isolates i.e growth of more than one bacteria. [Table 2, Figure 2].

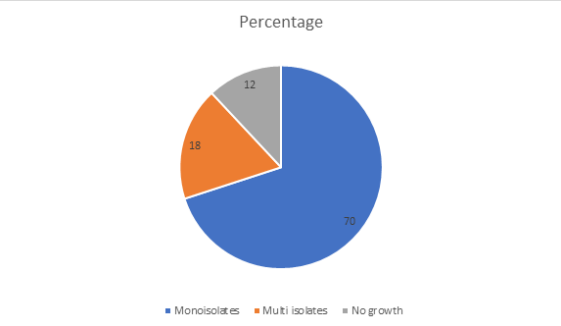

Figure 2: Percentage of culture with growth

The frequency of Staphylococcus aureus being isolated from post operative wound was maximum accounting for 18 (40.90%) patients. It was followed by Klebseilla being isolated from 12 (27.26%) patients. The frequency of Escherichia coli bacteria being isolated from post operative wound infection was 3 (6.81%). The frequency of Pseudomonas aeruginosa bacteria being isolated from post operative wound infection was 8 (18.18%). The frequency of Proteus spp bacteria being isolated from post operative wound infection was 8 (18.18%). The frequency of other spp bacteria being isolated from post operative wound infection was 7 (15.90%). [Table 3]. It was observed that overall frequency of gram negative bacteria was greater as compared to gram positive bacteria. [Table 3, Figure 3]

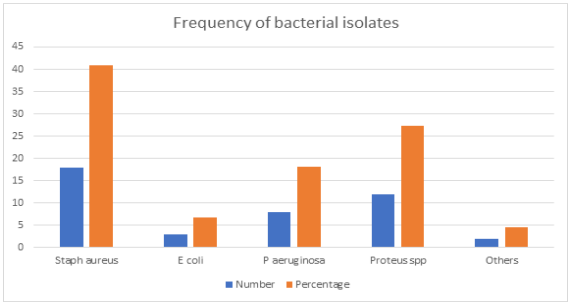

Figure 3: Frequency of pathogenic bacteria isolates from post operative wound infection

[Table 4] represent antibiotic susceptibility and antibiotic sensitivity of different bacteria. Staph aureus was sensitive to Ceftriaxone in 13.4% isolates and it was resistance to Ceftriaxone in 86.6% isolates. Staph aureus was sensitive to Cefuroxime in 18.3% isolates and it was resistance to Cefuroxime in 81.7% isolates. Staph aureus was sensitive to Ceftazidine in 13.4% isolates and it was resistance to Ceftazidine in 86.6% isolates. Staph aureus was sensitive to Gentamicin in 13.4% isolates and it was resistance to Gentamicin in 86.6% isolates. Staph aureus was sensitive to Amikacin in 72.8% isolates and it was resistance to Amikacin in 27.2% isolates. Staph aureus was sensitive to Levofloxacin and ciprofloxacin in 31.6% isolates and it was resistance to Levofloxacin and ciprofloxacin in 68.4% isolates. Staph aureus was sensitive to Imipenem in 72.5% isolates and it was resistance to Imipenem in 27.5% isolates. Staph aureus was resistance to Amoxicillin/clavulananic acid in 100% isolates. Staph aureus was sensitive to Erythromycin and clindamycin in 40.9% isolates and it was resistance to Erythromycin and clindamycin in 50.1% isolates. Staph aureus was resistance to Meripenem in 100% isolates. Staph aureus was sensitive to Cefipime and Cefoxitin in 13.8% isolates and it was resistance to Cefipime and Cefoxitin in 86.2% isolates.

It was observed that Staph aureus was having resistance against antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, Gentamycin, Levofloxacin, ciprofloxacin, Amoxicillin/ clavulananic acid. While it was highly sensitive to antibiotics like Amikacin, Imipenem, Cefipime, Cefoxitin. It was moderately sensistive to erythromycin and clindamycin.

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Escherichia coli was sensitive to Ceftriaxone, Cefuroxime, Ceftazidine and Cefipime in 23.3% isolates and it was resistance to Ceftriaxone in 76.7% isolates. Escherichia coli was sensitive to gentamycin, Levofloxacin and Ciprofloxacin in 53.8% isolates and it was resistance to gentamycin, Levofloxacin and Ciprofloxacin in 46.2% isolates. Escherichia coli was sensitive to Amikacin in 76.8% isolates and it was resistance to Amikacin in 23.2% isolates. Escherichia coli was sensitive to Imipenem in 100% isolates.

Escherichia coli was having resistance against antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine and Cefipime, Ceftazidine, Amoxicillin/clavulananic acid. While it was highly sensitive to antibiotics like Amikacin, Imipenem. It was moderately sensitive to erythromycin and clindamycin.

It was observed that Klebseilla was highly resistant to antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, gentamycin, Amoxicillin/clavulananic acid, Meropenem and Cefipime (100%). It was observed that Klebseilla was sensitive to antibiotics like Amikacin, Levofloxacin, Ciprofloxacin and Imipenem.

It was observed that Pseudomonas and Proteus species was highly resistant to antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, gentamycin, Amoxicillin/clavulananic acid, Meropenem and Cefipime. It was observed that Pseudomonas and Proteus species was sensitive to antibiotics like Amikacin, Levofloxacin, Ciprofloxacin and Imipenem. [Table 4, Figure 4]

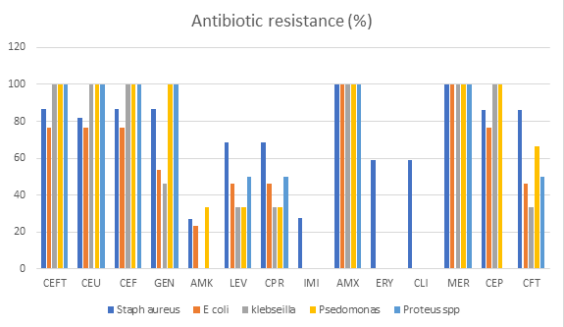

Figure 4: Antibiotic resistance of bacterial isolates from Surgical Wound infections

It was reported that resuturing was required in 27 (54%) patients of SSI. [Table 5]

Table 1: Percentages of patients with a wound infection after caesarean section.

	SSI present	SSI absent
Number	50	573
Percentage	8.72	91.28

Table 2: Percentage of culture with growth

	Number	Percentage
Monoisolates	35	70.0
Multi-isolates	9	18.0
No growth	6	12.0

Table 3: Frequency of pathogenic bacteria isolates from post operative wound infection

	Number	Percentage
Staphylococcus aureus	18	40.90
Escherichia coli	3	6.81
Pseudomonas aeruginosa	8	18.18
Klebsiella	12	27.26
Proteus spp	7	15.90
Others	2	4.54

Table 4: Antibiotic susceptibility and antibiotic resistance of bacterial isolates from Surgical Wound infections

Gram positive			**Gram negative**							
Staph aureus			**E Coli**		**Klebseilla**		**Pseudomonas**		**Proteus spp**	
Antibiotic susceptibility (%)										
	S	R	S	R	S	R	S	R	S	R
CEFT	13.4	86.6	23.3	76.7	0	100	0	100	0	100
CEU	18.3	81.7	23.3	76.7	0	100	0	100	0	100
CEF	13.4	86.6	23.3	76.7	0	100	0	100	0	100
GEN	13.4	86.6	53.8	46.2	0	100	0	100	0	100
AMK	72.8	27.2	76.8	23.2	100	0	66.5	33.5	100	0
LEV	31.6	68.4	53.8	46.2	66.4	33.6	66.5	33.5	50.0	50.0
CPR	31.6	68.4	53.8	46.2	66.4	33.6	66.5	33.5	50.0	50.0
IMI	72.5	27.5	100	0	100	0	100	0	100	0
AMX	0.0	100	0	100	0	100	0	100	0	100
ERY	40.9	59.1	-	-	-	-	-	-	-	-
CLI	40.9	59.1	-	-	-	-	-	-	-	-
MER	0.0	100	0	100	0	100	0	100	0	100
CEP	13.8	86.2	23.3	76.7	0	100	0	100	100	0
CFT	13.8	86.2	53.8	46.2	66.4	33.6	33.5	66.5	50.0	50.0

S= susceptible, R= Resistant

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"CEFT = Ceftriaxone; CUE = Cefuroxime; CEF = Ceftazidine; GEN = Gentamicin; AMK = Amikacin; LEV = Levofloxacin; CPR = Ciprofloxacin; IMI = Imipenem; AMX = Amoxicillin/clavulananic acid; ERY = Erythromycin; CLI = Clindamycin; MER = Meropenem; CEP = Cefipime; CFT = Cefoxitin"

Table 5: Resuturing required

	No	Percentage
Resuturing required	27	54
Resuturing not required	23	46

DISCUSSION

This study was conducted to determine the spectrum of bacterial pathogens isolate from infected surgical site and to determine the antimicrobial susceptibility. In this study total 623 patients were evaluated during the 6 month duration retrospectively. Out of this, 50 patients were found to suffer from SSI. The overall percent of patients with SSI was 8.72%. All the infections were reported within 30 days of surgery.

The incidence of post-caesarean wound infection in this study was 8.72%, which is comparable to 7.0% reported in Abakiliki, Nigeria and 9.1% reported in Kano, Nigeria.[28,32] However, it is lower than 10% reported in Lagos and 12.5% in Nnewi, Nigeria.[33,34] Different demographics under investigation, the range of indications for caesarean sections carried out in various centers, and the prevalence of risk factors for surgical site infections within the hospital could all be contributing causes to the heterogeneity shown in these research.

In our study the frequency of Staphylococcus aureus being isolated from post operative wound was maximum accounting for 18 (40.90%) patients. It was followed by Klebsiella being isolated from 12 (27.26%) patients. The frequency of Escherichia coli bacteria being isolated from post operative wound infection was 3 (6.81%). The frequency of Pseudomonas aeruginosa bacteria being isolated from post operative wound infection was 8 (18.18%). The frequency of Proteus spp bacteria being isolated from post operative wound infection was 8 (18.18%). The frequency of other species bacteria being isolated from post operative wound infection was 7 (15.90%). [Table 3]. It was observed that overall frequency of gram negative bacteria was greater as compared to gram positive bacteria.

The findings of our study are similar to findings of other studies that also find that most prevalent bacteria were Staphylococcus aureus in the isolates obtained from the site of SSIs. Anderson DJ et al,[10] Liu R,[11] Classen DC,[14] in their studies found Staphylococcus aureus to be most prevalent bacteria in SSI infection after caesarean. The findings are similar to the findings of present study.

It was observed that Staph aureus was having resistance against antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, Gentamycin, Levofloxacin, ciprofloxacin, Amoxicillin/ clavulananic acid. While it was highly sensitive to antibiotics like Amikacin, Imipenem, Cefipime, Cefoxitin. It was moderately sensistive to erythromycin and clindamycin.

Escherichia coli was having resistance against antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine and Cefipime, Ceftazidine, Amoxicillin/clavulananic acid. While it was highly sensitive to antibiotics like Amikacin, Imipenem. It was moderately sensitive to erythromycin and clindamycin.

It was observed that Klebseilla was highly resistant to antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, gentamycin, Amoxicillin/clavulananic acid, Meropenem and Cefipime (100%). It was observed that Klebseilla was sensitive to antibiotics like Amikacin, Levofloxacin, Ciprofloxacin and Imipenem.

It was observed that Pseudomonas and Proteus species was highly resistant to antibiotics like Ceftriaxone, Cefuroxime, Ceftazidine, gentamycin, Amoxicillin/clavulananic acid, Meropenem and Cefipime. It was observed that Pseudomonas and Proteus species was sensitive to antibiotics like Amikacin, Levofloxacin, Ciprofloxacin and Imipenem.

There have been reports of high resistance patterns.[14] These results contrast with those of a prior study conducted in Ibadan, southwest Nigeria, which found that isolates of S. aureus were extremely susceptible to amoxicillin and cephalosporins.[15] According to a different study conducted in Ife, Nigeria, isolates of S. aureus are extremely susceptible to cephalosporins and fluoroquinolones.[16] The gram-negative isolates exhibited intermediate resistance to fluoroquinolones, strong resistance to cephalosporins, gentamicin, and amoxicillin/ clavulanate, and high sensitivity to imipenem and amikacin. Gram-negative isolates, however, were found to be extremely sensitive to cephalosporins and fluoroquinolones in a research conducted in southwest Nigeria.[15]

One possible explanation for first-line antimicrobial agent resistance trend seen in this study is the careless usage of these medications. Given the widespread non-prescription usage of beta-lactam antibiotics to treat a variety of clinical conditions, which promotes resistance, this could be a reflection of the pattern of antibiotic use and misuse in the research environment. It's possible that high sensitivity to imipenem and amikacin results from these medications' limited exposure to prescription antibiotics, which are comparatively more costly.

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CONCLUSION

The overall percent of patients with SSI was 8.72%. The most frequently isolated bacteria from post-caesarean wound infections were Staphylococcus aureus, Klebsiella pneumonia, and Pseudomonas. Imipenem and amikacin showed least resistance to most frequently isolated bacteria from post-caesarean wound infections, therefore they can be used as the first line antibiotics empirically to treat post-caesarean wound infections with.

Ethical clearance has been taken from ethical committee of our institute.

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