

## A study of post-cesarean surgical site infections in a tertiary care unit

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### Abstract

**Introduction:** Surgical site infection in cesarean deliveries is a major cause of morbidity and mortality, increasing both in duration of patient hospitalization and hospital costs. There has been an alarming increase in the incidence of SSI in both developing and developed countries accounting for 20-25% of the nosocomial infections worldwide. Multiple risk factors causing post-cesarean SSI have been documented. Despite most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis, surgical site infections remain a major cause of hospital-acquired infections.

**Material and methods:** This is a prospective observational study performed from January 2015 to June 2017 with 1304 patients as the study population. All these patients were thoroughly examined and investigated. Wound was checked on day 5 of LSCS and in patients with SSI, wound swab was sent for culture sensitivity. Risk factors contributing to the SSI were noted. The wound was graded according to Southampton's grading system and further treatment was done in accordance to the grade of wound and the culture sensitivity report.

**Results:** 1304 were LSCS patients who were eligible for analysis, of which 43 patients developed surgical site infection which was 3.29% wound infection rate, of which 69% were emergency and 31% were elective. These patients were evaluated for risk factors and prolonged leaking per vaginum was the most common one. The wounds were graded according to Southampton's wound grading system and most wounds were found to be 3a subtype while E. coli was the organism most commonly detected amongst the 18 patients with a culture positive report.

**Keywords:** Surgical site infections (SSI); cesarean delivery (CD).

### 1. Introduction

Cesarean delivery (CD) is one of the commonest surgeries worldwide. Surgical site infection (SSI) following cesarean delivery is a major cause of morbidity and mortality, increasing both the duration of patient hospitalization and hospital costs. Surgical site infection (SSI) is one of the complications which arises later on in the postoperative period with an incidence five to twenty times that of vaginal delivery. A consistent increase has been observed in the rate of cesarean deliveries in most of the developed countries and many developing countries

including India over the last few decades and is a matter of concern. Surgical site infections (SSIs) have been reported to be one of the most common causes of nosocomial infections; is accounting 20% to 25% of all nosocomial infections worldwide. SSIs have been responsible for the increasing cost; morbidity and mortality related to surgical operations and continue to be a major problem worldwide. Globally, surgical site infection rates have been reported to range from 2.5% to 41.9%. Among the risk factors described for post-cesarean SSI are prolonged labor, premature rupture of membranes, excess vaginal

manipulation, manual extraction of the placenta, and premature birth. Comorbidities such as HIV, severe anemia and gestational diabetes are also associated with higher rates of puerperal infection, particularly surgical wound infection. Despite improvements in operating room practices, instrument sterilization methods, better surgical technique and the best efforts of infection prevention strategies, surgical site infections remain a major cause of hospital-acquired infections and rates are increasing globally even in hospitals with most modern facilities and standard protocols of preoperative preparation and antibiotic prophylaxis.

## 2. Material and methods

This is a prospective observational study performed at a tertiary health centre at Mumbai. After the Ethical committee approval, the departments of Obstetrics and Gynaecology and Microbiology evaluated all cesarean deliveries performed from January 2015 to June 2017 for SSI. The study population was 1304 patients. All these patients were thoroughly examined and investigated on admission and prepared for operative procedures through abdominal approach, either elective or emergency. The wound was checked on 5<sup>th</sup> post-operative day routinely and 10<sup>th</sup> day or any day that the patient came with complaints related to the wound. The inclusion criteria for enrollment on the study were pregnant patients who underwent cesarean section and were diagnosed to have SSI within 30 days of the obstetric procedure. For patients with SSI, wound swabs were sent for culture and sensitivity where discharge from the wound was present. Severities of the post-operative wound infection were graded according to the Southampton wound grading system. The medical records of the case patients were reviewed with respect to age, elective or emergency cesarean, comorbidities, duration of labor, use of appropriate antibiotic prophylaxis with 1.5 g of intravenous ceftriaxone and 100cc of metronidazole, duration of membrane rupture, length of hospitalization, day of surgery on which SSI was detected and the treatment of the SSI. Micro-organisms were identified and their antibiotic sensitivity were done. Treatment was started in accordance with the culture sensitivity report. Patient's progress and the response to drug treatment were monitored. If needed secondary suturing was done and noted. Complications and their cause were identified thereby providing a clue to their successful prevention.

## 3. Results

In present study based on our inclusion criteria, total 3624 patients delivered amongst which 1304 were LSCS patients who were eligible for analysis, of which 43 patients developed surgical site infection which was 3.29% wound infection rate. Of these 43 patients, 30 were

emergency cesarean sections and 13 were elective cesarean sections.

**Table 1: Type of cesarean section**

Type of cesarean section	Emergency	Elective	Total
Number of patients	30	13	43
Percentage of total	69%	31%	100%

Of the patients with SSI, multiple risk factors were found like anemia i.e. hemoglobin < 10 gm%, prolonged leaking per vaginum (i.e. leaking more than 18 hours), previous LSCS, elderly gravida i.e. age more than 35 years, PIH, GDM etc. However many patients were seen to have more than one risk factor and some had no risk factor at all.

**Table 2: Risk factors**

Risk factors	Total number of patients	Percentage
Prolonged time in labour	11	25.5%
Anemia	8	18.6%
Previous LSCS	9	20.9%
GDM	3	6.9%
PIH	5	11.6%
Obesity	7	16.2%
Elderly gravida	2	4.6%
None	3	6.9%

All the patients with wound discharge detected on day 5 of surgery or later were graded according to the Southampton wound grading system.

**Table 3: patients grading according to the Southampton wound grading system**

Grading of wound	Number of patients	Percentage
1a	1	2.3
1b	1	2.3
1c	1	2.3
2a	2	4.6
2b	2	4.6
2c	3	6.9
2d	3	6.9
3a	8	18.6
3b	7	16.2
3c	7	16.2
3d	6	13.9
4a	1	2.3
4b	1	2.3
5	0	0
Total	43	100

In patients who came with complaints of wound discharge, swab was sent for culture and antibiotic sensitivity. Amongst the patients with SSI, 18 swabs were positive for growth.

**Table 4: Patients with complaints of wound discharge, swab**

Organism	Number of patients	Percentage
<i>E. coli</i>	7	38%
<i>Klebsiella</i>	4	23%
<i>Pseudomonas</i>	4	23%
<i>Citrobacter</i>	3	16%
Total	18	100

The swabs which were positive for growth were subjected to antibiotic sensitivity and the results were as follows:

**Table 5: Antibiotic sensitivity**

Antibiotic	<i>E. coli</i>	<i>Klebsiella</i>	<i>Pseudomonas</i>	<i>Citrobacter</i>
Ampicillin + Sulbactam	71.4%	25%	-	100%
Gentamycin	100%	75%	50%	50%
Amoxycillin + Clavulanic acid	57.1%	57.1%	-	75%
Meropenem	-	-	50%	-
Cefazidime	-	-	50%	-
Cefotaxime	-	-	50%	-
Carbenicillin	-	-	50%	-
Tobramycin	-	-	50%	-
Ofloxacin	42%	75%	-	100%
Cotrimoxazole	57.1%	-	-	-
Ceftriaxone	-	-	-	75%

*E. coli* was found to have highest sensitivity to Gentamycin (100%) and was also sensitive to Ampicillin + sulbactam, Amoxycillin and clavulanic acid and Cotrimoxazole and Ofloxacin. *Klebsiella* had highest sensitivity to Gentamycin (75%) followed by Ofloxacin.

Depending on the grade of the wound infection, the treatment options included daily dressing of the wound, antibiotic coverage and if need be secondary suturing of the wound. The outcome of the wound was as follows:

**Table 6: Treatment modality**

Treatment modality	Number of patients	Percentage
Dressing	6	13.9%
Dressing with antibiotic coverage	17	39.5%
Secondary suturing	20	53.6%
Total	43	100%

#### 4. Discussion

Amongst the 1304 patients undergoing cesarean sections, 43 patients had SSI which was a wound infection rate of 3.29% as compared to 6.12% seen in the study by Amrita *et al.*[1] Out of the 43 patients with SSI, 30 patients had undergone an emergency LSCS i.e. 69% and 13 had undergone an elective LSCS i.e. 31% comparable with the study performed by Jahanara Rahman *et al.*[2] Prolonged labor was noted to be the single most common independent risk factor for surgical site infection in this study (25.5%) as compared to previous cesarean section (24.58%) and prolonged rupture of membranes (>4hrs) (22.03%) as risk factor seen in study by Amrita *et al.*[1] Other contributing risk factors were anemia (18.6%), previous LSCS (20.9%), obesity (16.2%), PIH (11.6%), GDM (6.9%) and elderly gravida (4.6%). 6.9% patients were found to have no risk factors at all. Uncontrolled Diabetes and anemia delay wound healing, and causes tissue breakdown which leads to SSI.[1] Increased amount of fat in subcutaneous plane causes lipolysis in obese patients which contributes in SSIs as serous discharge.[1] The incidence of prolonged rupture of membrane, prolonged labour, repeated internal

examination in labour, trial of labour at home invites bacterial invasion and increases the chance of wound infection.[1] According to the hospital protocol, the wound was checked on day 5 of surgery and on day 10 or any day earlier that the patient came with complaints related to the wound. In case of an SSI, a swab was sent for culture and sensitivity. Of the 43 patients, 18 were found to be positive for growth. *Escherichia coli* was the most common cause of SSI, accounting for 38% of cases. It originates from fecal flora that colonizes the peri-urethral area (ascending infection).[1] *Klebsiella* (23%) and *pseudomonas* (23%) species caused most of the remaining cases. Gram-negative organism *Citrobacter* was also a clinically important pathogen, contributing 16% of the infections. Urea-splitting bacteria including *Proteus*, *Klebsiella* alkalinize the urine and may be associated.[1] In the study by TA Jido *et al* in 31.8% *Staphylococcus aureus* was grown, while 13.6% produced *E. coli*, 6.8% *Pseudomonas* spp. and 2.3% each for *Salmonella* and *Morganella morganii*. [3] The 43 patients with SSI were then graded according to Southampton's wound grading system. Most patients belonged to grade 3a and there were no patients who belonged to grade 5. Depending on the type of wound and the culture sensitivity report of the discharge the treatment options were dressing, dressing with antibiotic coverage with or without secondary suturing. Amongst the 43 patients, 20 required secondary suturing.

#### 5. Conclusion

Surgical site infections determine the final outcome of a cesarean section apart from the morbidity and mortality they cause. Though surgical care is very important to prevent wound infection, but some pre and postoperative steps can reduce postoperative wound infections also. Each post operative wound infection (SSI) further caused a heavy toll on the nutrition of the patient, and further accentuated the mal-nutrition. They also increase the cost of treatment for a particular surgical operation, as infection in a post operative wound increases the length of stay in the hospital. The cost of antibiotics and increased duration of antibiotic therapy further adds on to the cost of treatment. If we can eradicate anaemia in pregnancy, control diabetes, avoid prolonged labour, use potent antibiotics in cases of rupture of membrane, do timely intervention, provide well equipped obstetrics ward with clean environment, then incidence of wound infection can be lowered. The merit of the study was to start the active surveillance of surgical site infections based on standard definitions and methods to be maintained by cooperation of infection control practitioners and surgical team. Identification of risk factors for surgical site infections has encouraged the development of recommendations for prevention of SSI in order to achieve the setting goal to reduce the SSI.

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