

**Post Caesarean Section: Surgical Site Infection**

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**Abstract**

Caesarean section is a major obstetrical surgical procedure in modern obstetrics which saves the lives of foetuses and mothers. Surgical site infections (SSI) are the second most common infectious complication after urinary tract infection following caesarean delivery and increases 5-20% risk of infection occurrence. About 14 - 16% of patients admitted in the hospital affects from surgical site infection. This prospective analytical study over the period of 6 months were conducted with the aim to determine the incidence, risk factors and the organisms causing SSI and their sensitivity to different antibiotics in post caesarean surgical site infection patients, to compare SSI in primi gravida and multigravida and to compare SSI in emergency and elective caesarean section. A total of 700 patients were assessed for SSIs among them the mean age of the patients was  $26.6471 \pm 2.4576$  years, mean BMI of patients was  $23.1099 \pm 2.0996$  kg/m<sup>2</sup>, most (53.6%) of the patients were from lower middle class, 85.1% patients were booked and majority (84.6%) of the

patients had emergency caesarean section. The average number of vaginal examination of patients was  $2.7043 \pm 1.3615$  and mean post-operative day of presentation of surgical site infections were  $10.0833 \pm 1.8887$ . The overall prevalence of SSI was 6.9%. The study concluded that there was a significant association between post caesarean section surgical site infection (SSI) with various risk (obstetrical and medical) factors which should be evaluated for better understanding of the causes and evolution of surgical site infection after caesarean delivery.

**Keywords:** Caesarean section, Post -operative, surgical site infection, SSI, Obstetrical complications, Antibiotics and Risk factors.

**Introduction**

Surgical site infections (SSI) are most common type of hospital acquired infections. About 14 -16% of patients admitted in the hospital affects from surgical site infection.<sup>1</sup>

Caesarean section is a major obstetrical surgical procedure in modern obstetrics which saves the lives of

foetuses and mothers.<sup>2</sup> SSI is the second most common infectious complication after urinary tract infection following caesarean delivery and increases 5-20% risk of infection occurrence.

Surgical site infection leads to morbidity and mortality among mothers. There are various risk factors for SSI such as timing of prophylactic antibiotics (>1hour), prolonged rupture of membranes, prolonged duration of labour, (>1hour), type of operation, abruption, failed induction, booking status, etc.<sup>3</sup>

The increase in duration of surgery is associated with a significant rise in the rate of SSI.<sup>4</sup>

The caesarean wound infection results in prolonged hospital stay, increase in healthcare expenditure, as well as other morbidities and mortality.<sup>5-7</sup>

Surgical wounds can become infected by germs that are already on your skin that spread to the surgical wound, germs that are inside your body or from the organ on which the surgery were performed, germs that are in the environment around you such as infected surgical instruments or on the hands of the health care provider.

Thus, the surveillance of postoperative wound infection or surgical site infection (S.S.I.) is a most important tool to identify the problem.

### **Aims and Objectives**

The present study aimed:

1. To determine the incidence, risk factors and the organisms causing SSI and their sensitivity to different antibiotics in post caesarean surgical site infection patients.
2. To compare SSI in primigravida and multigravida.
3. To compare SSI in emergency and elective caesarean section.

### **Material and methods**

This prospective analytical study was conducted in the Department of Obstetrics and Gynaecology, Sanjay Gandhi Memorial Hospital over a period of six months (January, 2021 to June, 2021). A total of 700 patients under went consecutive emergency/elective caesarean sections were assessed for the surgical site infections (SSIs).

Pus sample was taken from all the patients presenting with SSI and was sent to microbiology department of Sanjay Gandhi Memorial hospital and antibiotics were started according to pus culture and sensitivity report.

### **Inclusion criteria**

All patients who underwent caesarean sections were included in this study up till 30 days following surgery.

### **Exclusion criteria**

- Patients with wound infection after 30 days of caesarean section.
- Caesarean section done outside this hospital.
- Patient refusing to participate in this study.

The data was collected and recorded in Microsoft excel spreadsheet and then analyzed by SPSS (version 27.0; SPSS Inc., Chicago, IL, USA) and Graph Pad Prism version 5. Descriptive statistics were calculated as mean and standard deviation for continuous data and as number and percentage for categorical data.

Associations were assessed using Chi-square test or Fischer's exact test, as appropriate for categorical data and independent t-test for continuous data. Level of significance for the present study was set at p values of less than 0.05.

### **Observation and Result**

A total of 700 patients were assessed for SSIs. The mean age of the patients was 26.6471±2.4576 years, mean BMI of patients was 23.1099± 2.0996 kg/m<sup>2</sup>, most

(53.6%) of the patients were from lower middle class, 85.1% patients were booked and majority (84.6%) of the patients had emergency caesarean section. The average number of vaginal examination of patients was  $2.7043 \pm 1.3615$  and mean post-operative day of presentation of surgical site infections were  $10.0833 \pm 1.8887$ .

Table 1: Obstetrical Parameters

Obstetrical parameters	Number	Percentage
Multigravida	337	48.1
Primigravida	363	51.9
Prolonged labor	26	3.7
Prolonged rupture of membranes	42	6.0
Duration of operation <1hr	648	92.6

Table 1 showed the obstetrical parameters, it was found that most of the patients (51.9%) were primi gravida, 3.7% patients had prolonged labor, 6.0% had prolonged rupture of membranes and majority (92.6%) patients had duration of operation less than 1 hour.

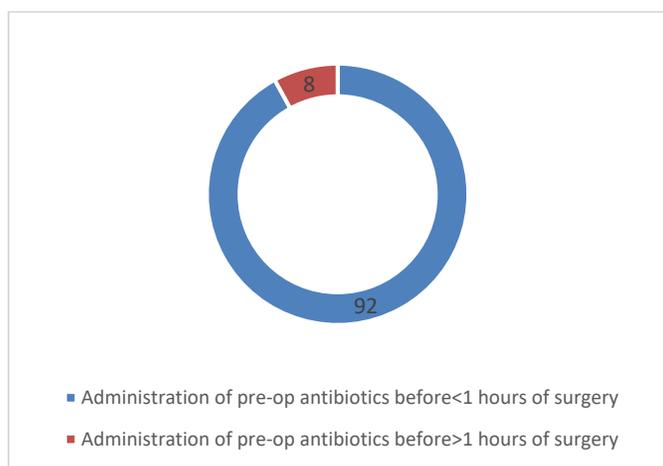


Figure 1: Timing of pre-op antibiotics

It was observed that most (92.0%) of the patients received pre-op antibiotics in <1 hour before surgery and

8.0% patients received pre-op antibiotics >1 hour before surgery.

Table 2: SSIs & common microorganism found

SSIs & MO	Number	Percentage
SSIs	48	6.9
Acinetobacter	6	12.5
E.coli	12	25
No growth	18	37.5
Pseudomonas	1	2.1
Staph. Aureus	10	20.8
Staph. Aureus and E.coli	1	2.1

Table 2 depicted that overall prevalence of surgical site infection was found in 6.9% and the most (37.5%) of the patients had no growth followed by 12.5% Acinetobacter, 25% E.coli, 2.1% Pseudomonas, 20.8% Staph. Aureus and 2.1% Staph. Aureus and E.coli.

The present study revealed that the most (20.2%) of the patients were sensitive to cotrimoxazole followed by ciprofloxacin, polymyxin- B and amikacin (11.5% each respectively), vancomycin and gentamycin (10.1% each respectively) as depicted in figure 2. Further it was reported that E.coli was mostly sensitive to clotrimoxazole and amikacin while staph aureus was most commonly sensitive to ciprofloxacin, vancomycin and linezolid and acinetobacter was most commonly sensitive to polymyxin Band clotrimoxazole.

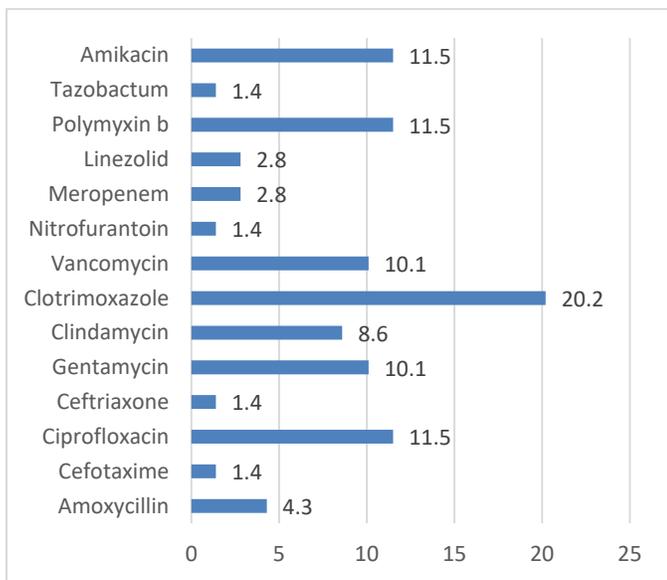


Figure 2: Sensitive to drug

In the present study a statistical significant association of surgical site infection with age of the patients ( $P < 0.0001$ ), booked / un-booked status ( $P < 0.0001$ ), duration of labour ( $P < 0.0001$ ), duration of rupture of membranes ( $P < 0.0001$ ), duration of operation ( $P < 0.0001$ ), pre-operative antibiotics administration ( $P < 0.0001$ ), type of micro-organisms found ( $P < 0.0001$ ), mean BMI of the patients ( $P < 0.0001$ ), and number of vaginal examinations ( $P < 0.0001$ ).

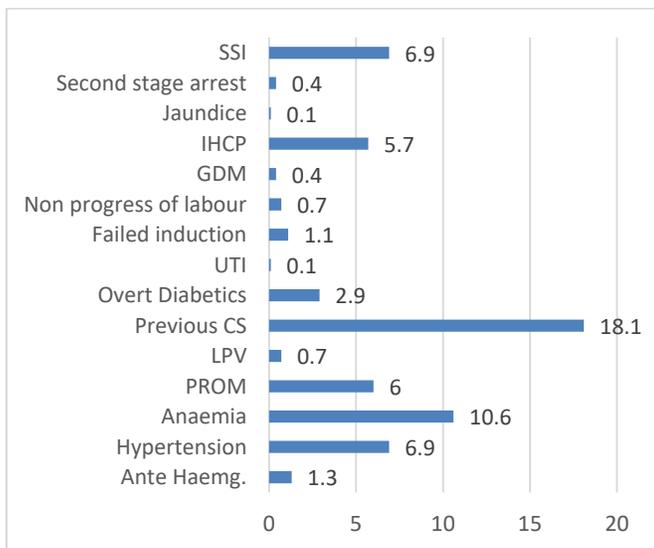


Figure 3: Obstetrical and medical risk factors

Figure 3 represented the obstetrical and medical risk factors among patients and it was found that previous caesarean section was the commonest factor (18.1%) followed by anemia (10.6%), hypertension & SSI (6.9% each), PROM (6%), IHCP (5.7%), overt diabetes (2.9%), antepartum hemorrhage (1.3%), failed induction (1.1%), LPV & non progress of labour (0.7% each), GDM & second stage of labour (0.4% each), and UTI & jaundice (0.1% each).

Further a statistically significant association was found between surgical site infection and obstetrical and medical risk factors (anaemia, PROM, LPV, previous caesarean section, diabetes, failed induction, non-progress of labour, GDM and second stage arrest) ( $P < 0.0001$ ).

### Discussion

The present study included a total of 700 patients among them the incidence of post caesarean SSI was found in 6.9% patients. The findings are in accordance with study conducted by Zejnnullahu VA et al (2019)<sup>8</sup>, found that overall SSI rate was 9.85%. Alfouzan W et al (2019)<sup>9</sup> conducted a prospective study and found that overall SSI rate in post caesarean patients in hospital was 2.1%. As per the study conducted by Gelaw KA et al (2017)<sup>10</sup>, surgical site infection after caesarean section was 6.8%.

In our study it was found that, was found that increased age of mother pre disposes her to infections, patients with SSI, 45.8% patients were booked and 54.2% patients were unbooked. This was statistically significant ( $p < 0.0001$ ). It was found that the mean BMI (mean±s.d.) of patients was  $23.1099 \pm 2.0996$  kg/m<sup>2</sup>. Similarly, Dessu Setal (2021)<sup>11</sup> observed that increased age of the mother, booking status, obesity, higher number of per vaginal examination, having a history of chorio amnionitis, having previous history of caesarean section,

not receiving antibiotics prophylaxis, lower peri operative haematocrit level and longer duration of rupture of membrane were statistically significant in multivariable analysis.

In present study it was found that patients with SSI, the mean BMI of patients was  $24.6917 \pm 2.3800$  (kg/m<sup>2</sup>) which was statistically significant ( $p < 0.0001$ ). The findings are correlated with the study conducted by Kristian Opøien H et al (2007)<sup>12</sup> found 2 significant independent risk factors were operating time > 38 min and body mass index (BMI).

The findings observed that patients with SSI, 41.7% patients had prolonged labour which was statistically significant ( $p < 0.0001$ ). Lilani SP et al (2005)<sup>4</sup> found that the increase in duration of surgery was associated with a significant rise in the rate of surgical site infection.

Further patients with SSI, 10.4% patients had Elective CS and 89.6% patients had emergency CS. In the study conducted by Farret TC et al (2015)<sup>13</sup> it was found that surgical site infections are more common after emergency caesarean section.

The study showed that patients with SSI, 32.5% patients had prolonged rupture of membranes which was statistically significant ( $p < 0.0001$ ). Prolonged rupture of membranes refers to rupture of membranes lasting longer than 18-24 hours. In similar study conducted by De D et al (2013)<sup>3</sup> it was found that PROM, antibiotics given earlier than 2 hours and increased duration of stay in the hospital were found to be significant. A proper assessment of risk factors that predispose to SSI and their modification may help in reduction of SSI rates.

In present study it was found that, patients with SSI, 47.9% patients received pre-op antibiotics < 1hr and 25 (52.1%) patients received pre-op antibiotics > 1 hr which was statistically significant ( $p < 0.0001$ ). Alfouzan W et

al (2019)<sup>9</sup> found that emergency CS and in appropriate antibiotic prophylaxis are risk factors for developing SSI. In the light of the emergence of MDR bacteria there is a need to implement revised prophylactic antibiotic policy as part of anti-microbial stewardship to decrease SSI rates.

In our study it was found that in patients with SSI, 6 (12.5%) and the most (37.5%) of the patients had no growth followed by 12.5% Acinetobacter, 25% E.coli, 2.1% Pseudomonas, 20.8% Staph. Aureus and 2.1% Staph. Aureus and E.coli and the association of Bacteria detected with SSI was statistically significant ( $p < 0.0001$ ). Devi SL et al (2018)<sup>14</sup> found that Staphylococcus aureus to be predominant organism of wound infection of which 21% were MRSA followed by Klebsiella and E.coli. The gram negative isolates were 100% resistant to ampicillin followed by 22.5% to third generation cephalosporins and amino glycosides. Similarly, De D et al (2013)<sup>3</sup>, found that all patients were followed up from day one of surgery till discharge and then up till the post-operative day 30 after discharge. SSI occurred in 24.2% patients.

The present study suggests that patients with SSI, 35.4% patients had duration of operation < 1hr and 31 (64.6%) patients had duration of operation > 1 hr. It was statistically significant ( $p < 0.0001$ ), the mean number of vaginal examination of patients was  $3.5833 \pm 1.9982$  (kg/m<sup>2</sup>). It was statistically significant ( $p < 0.0001$ ), 6.6% patients had Anaemia, 1.1% patients had Ante partum haemorrhage, 1.7% patients had Diabetes, 5.6% patients had Hypertension, 4.9% patients had IHCP, 0.4% patients had Jaundice, 4.1% patients had PROM and the mean post-op day of presentation of patients was  $10.0833 \pm 1.8887$  days. Association of Obstetric and medical risk factor with SSI was statistically significant

( $p < 0.0001$ ). The findings are correlated with study conducted by Devi SL et al (2018)<sup>14</sup> found that Anaemia (48%) was the most common medical risk factor followed by hypertensive disorders 25%. The risk of post-operative infection has been shown to be proportional to volume of blood loss during caesarean section, duration of surgery and number of vaginal examination.

### Conclusion

The present study concluded that the caesarean section is the commonest procedure to deliver the foetus which carries risk of surgical site infection (SSI) which results in deteriorations in mother's health status. SSI was associated with various risk (obstetrical and medical) factors which should be evaluated for better understanding of the causes and evolution of surgical site infection after caesarean delivery.

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