

Surgical site infections following cesarean section at tertiary care hospital

Dr. Binika Patel¹, Dr. Lakshmi Rachkonda², Dr. Vishal Chaudhari³

Department of Obstetrics and Gynaecology, MGM Medical College and Hospital, Aurangabad, Maharashtra, India

Abstract

Background: Incidence of surgical site infection after cesarean section worldwide is between 3-15%. Globally there is increase in incidence of cesarean delivery and simultaneously occurrence of SSI. In this study we have analysed the incidence, risk factors and common bacterial pathogen and their sensitivity pattern in SSI following LSCS at tertiary care centre.

Materials and Methods: A retrospective study was conducted for patients who developed surgical site infection after LSCS from August 2021 to October 2022 at Obstetrics and Gynaecology department, MGM Medical College and Hospital, Aurangabad.

Results: During this study incidence of SSI was 3.75%. 63.6% patients with SSI had BMI above 25 kg/m². 25.45% patients underwent preterm LSCS. 40% had premature rupture of membranes. 90.9% were emergency LSCS. In 89.09% patients for skin closure nylon was used. 36.36% patient's skin closure done in subcutaneous manner while 63.63% skin closure done in vertical mattress manner. 25.45% patients required resuturing. Most common organism for SSI was staphylococcus hemolyticus in 27.27% followed by MRSA in 10.9%. According to our study tige cycline has highest sensitivity.

Conclusion: Identifying modifiable risk factors responsible for SSI, reporting of SSI, policy to prevent SSI and standard surgical techniques is necessary step to reduce incidence of surgical site infection and providing quality care to women.

Keyword: Surgical site infection, LSCS, Antibiotics sensitivity, Micro-organisms

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I. Introduction

Surgical site infection is defined by the Centres of disease control and prevention (CDC) criteria as an infection which occurs within 30 days after a surgical procedure. It can be divided into superficial SSI and deep SSI.¹ Incidence of surgical site infection after cesarean section worldwide is between 3-15%.² Globally there is increase in incidence of cesarean delivery and simultaneously occurrence of SSI. Post cesarean SSI results in increase cost, longer duration of hospital stay, increase in maternal morbidity and mortality.³ Pre existing risk factors for SSI are maternal age, obesity, anemia, previous cesarean section and diabetes mellitus. Pregnancy related factors like gestational diabetes mellitus, multiple pregnancy, prolonged labour, premature rupture of membranes and excessive blood loss during LSCS, blood transfusion and post operatively subcutaneous hematoma also increased risk.⁴ Surgical site infection is becoming a serious issue for the hospitals due to increase in isolation of atypical organism and resistant strains of typical organisms. Identification of the risk factors for SSI, micro-organisms responsible for SSI and their sensitivity pattern for antibiotics is necessary to make targeted strategies to prevent surgical site infection.⁵ Each hospital should have their own criteria to prevent surgical site infection according to prevalence of organisms in the hospital and sensitivity pattern and to decide the appropriate antibiotics.⁶

Our objectives for this study were

- 1) To study the incidence of surgical site infections
- 2) To evaluate the risk factors associated with it
- 3) To study the common pathogens
- 4) To evaluate their sensitivity pattern

II. Material and Methods

In our hospital, if surgical site infection is observed, incident form is filled which evaluates sign and symptoms of SSI, lab investigations and probable causes of SSI and wound swab for culture and sensitivity is sent.

A retrospective study was conducted from August 2021 to October 2022 at Obstetrics and Gynaecology Department, MGM Medical College and Hospital, Aurangabad. This study included all the patients who developed surgical site infection after LSCS.

The required details like Patient's demographic data, related history and clinical parameters data were taken from registers, case sheets and surgical site infection incident book.

Age	Number of Cases(N-55)	Percentage
<=19	3	5.45%
20-24	21	38.18%
25-29	23	41.8%
>=30	8	14.5%
TOTAL	55	100%

For the purpose of this study, wound culture and sensitivity reports were traced from Microbiology department and recorded in the proforma.

Data was then tabulated in MS Excel sheet for statistical analysis.

Data analysis was done using SPSS software.

This research was approved by the Ethical review committee, MGM hospital and medical college, Aurangabad.

III. Results

Table 1 : Age wise distribution (n-55)

In our study, 41.8% patients were between age group of 25-29 years, indicating common age group coming to our hospital.

Table 2 : Distribution according to BMI (n-55)

BMI(kg/m ²)	Number of cases(n-55)	Percentage
<18.5	1	1.81%
18.5-24.9	19	34.5%
25-29.9	25	45.45%
>30	10	18.18%
Total	55	100%

In our study 45.45% patients had BMI between 25-29 kg/m² and 18.18% had BMI above 30 kg/m², indicating that overweight and obesity could be an important risk factor for SSI.

Table 3 : Distribution according to area of residence (n-55)

Address	Number of cases(n-55)	Percentage
Urban	22	40%
Rural	33	60%
Total	55	100%

In our study, 60% patients were from rural area and 40% were from urban area, which suggests that there could be high risk of developing SSI in rural area because of poor hygiene and poor nutrition.

Table 4 : Distribution according to booking status (n-55)

Booking status	Number of cases(n-55)	Percentage
Unbooked	30	54.54%
Booked	25	45.45%
Total	55	100%

In our study, 54.54% patients were unbooked while 45.4% were booked, suggesting that even booked patients were not aware of hygiene and anemia.

Table 5 : Distribution according to gravida status (n-55)

Gravida status	Number of cases(n-55)	Percentage
Primigravida	19	34.54%
Multigravida	36	65.45%
Total	55	100%

In our study , 65.45% were multigravida while 34.5% were primigravida. Which signifies that there was high risk of SSI in multigravida which could be due to previous history of LSCS or abortions. Anemia could be a reason for developing SSI due to short interconceptional period in multigravida.

Table 6 : Distribution according to gestational age (n-55)

Gestational age	Number of cases(n-55)	Percentage
Pre- term LSCS	14	25.45%
Term LSCS	41	74.54%
Total	55	100%

In our study, 25.45% patients underwent pre-term LSCS which could be a risk factor for developing SSI as one of the etiologies of preterm labour infection.

Table 7 : Co morbidities and other risk factors

Risk factors	Number of cases	Percentage
PROM	22	40%
Anemia	19	34.54%
PPH	10	18.18%
HTN	5	9.09%
Diabetes	7	12.7%
Hypothyroidism	5	9.09%
H/O Tuberculosis	1	1.81%

In our study, among patients who developed SSI 34.54% had anemia which is a significant and preventable factor. In our study 12.7% had diabetes. Other medical disorders complicating SSI are not significant according to our study. 40% had PROM which could be a very important risk factor for developing SSI.

Table 8: Distribution according to H/O previous surgery

Previous h/o surgery	Number of cases	Percentage
Previous 1 LSCS	21	38.18%
Previous 2 LSCS	1	1.81%
Previous hysterectomy	1	1.81%
Previous abortions	18	32.72%

In our study, 38.18% had h/o previous 1 LSCS while 32.72% had h/o previous abortions. Which would indicate that there may be persistent low grade infection or endometritis, which could be a reason for developing SSI.

Table 9: Distribution according to timing of LSCS (n-55)

LSCS	Number of cases(n-55)	Percentage
Emergency	50	90.9%
Elective	5	9.09%
Total	55	100%

In our study, 90.9% were emergency LSCS, only 9.09% LSCS were elective LSCS. Indicating hurried pre-operative preparation of abdomen in emergency indications, which may be a causative factor.

Table 10 : Distribution according to placental position (n-55)

Placental position	Number of cases(n-55)	Percentage
Anterior	30	54.54%
Posterior	25	45.45%
Total	55	100%

In our study, 54.54% patients had anteriorly placed placenta, 45.45% had posteriorly lying placenta which suggests that placental localisation is not having any significance as far as SSI goes.

Table 11 : Suture material (n-55)

Suture material	Number of cases(n-55)	Percentage
Nylon	49	89.09%
Polyglactin	6	10.09%
Total	55	100%

In our study , in 89.09% patients skin closure done with nylon while, in 10.09% polyglactin was used for skin closure, which may be associated factor for developing SSI as polyglactin is polyfilament and braided suture material leading to more chances of microbial colonisation.

Table 12: Skin closure type and suture material (n=55)

	Nylon	Polyglactin	Total(n=55)
Subcutaneous	14	06	20(36.36%)
Vertical mattress	35	00	35(63.63%)
Total	49	06	55(100%)

In our study ,36.36% patient’s skin closure was done in subcutaneous manner for which nylon was used in 25.45% and polyglactin was used in 10.9%.

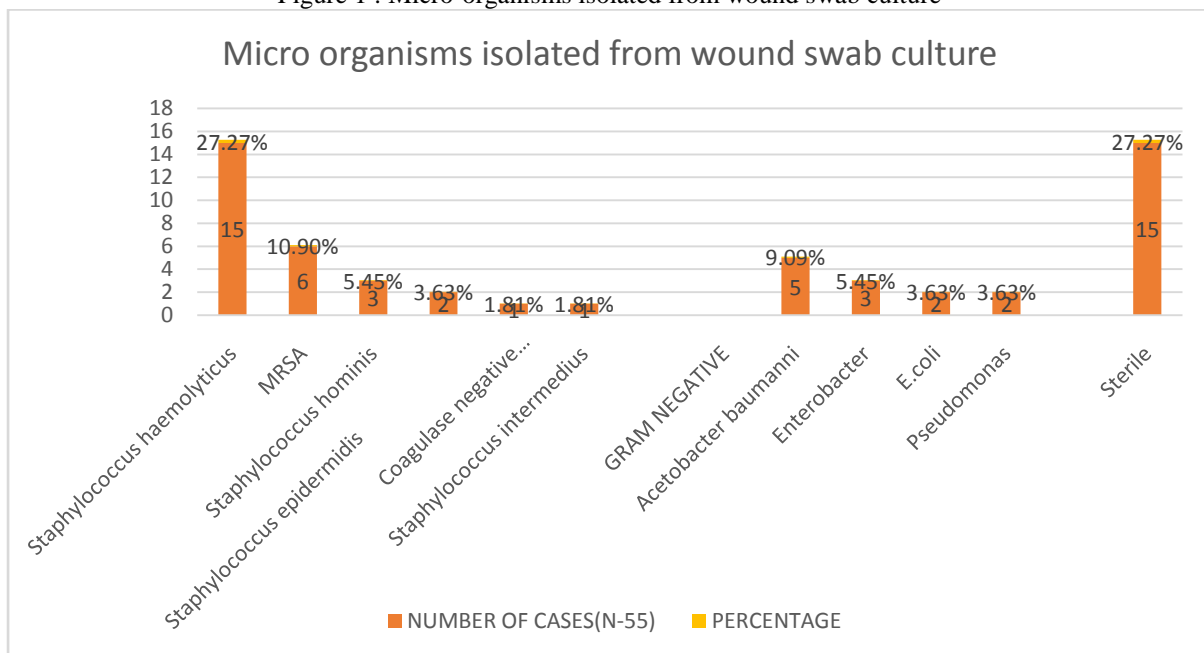
63.63% skin closure done in vertical mattress manner for which only nylon was used. Mattress suture may lead to tight suturing which may cause infection.

Table 13 : Method of healing (n=55)

Wound healing	Number of cases(n=55)	Percentage
Resuturing	14	25.45%
Secondary healing	41	74.54%
Total	55	100%

In our study , 25.45% patients required resuturing while in 74.54% healing was by secondary intention after starting antibiotics sensitivite to identified pathogen and daily dressing.

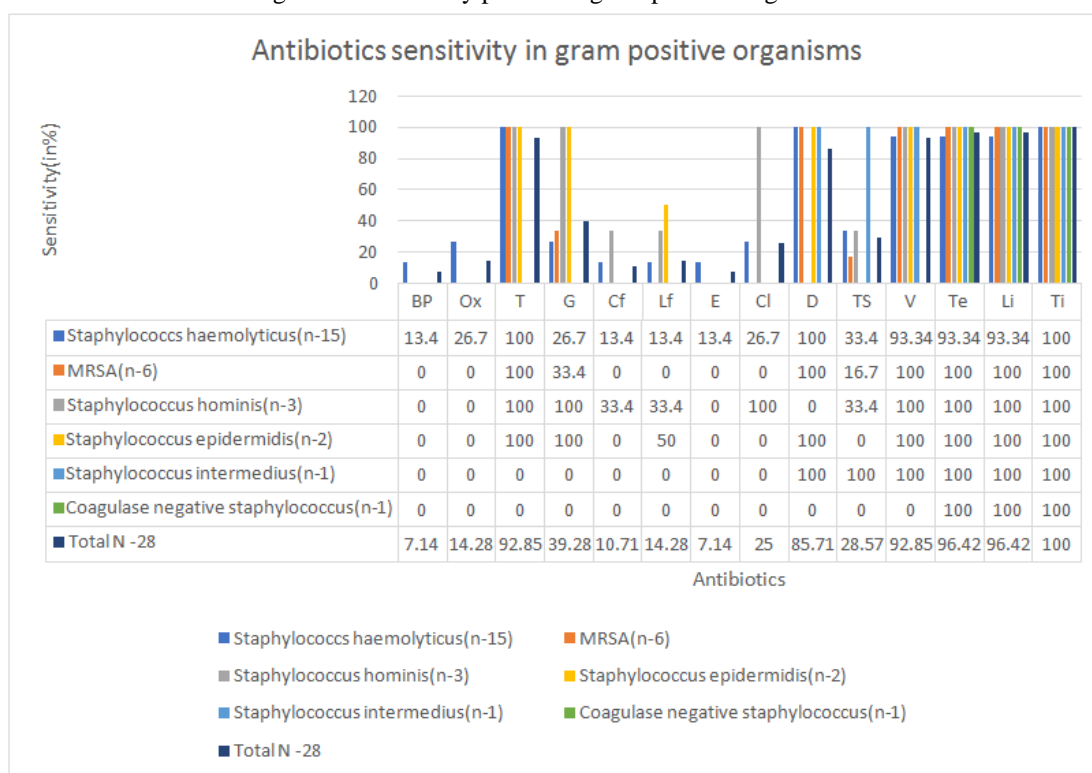
Figure 1 : Micro-organisms isolated from wound swab culture



In our study , 27.27% patient’s wound culture report was sterile.

Most common organism for SSI isolated was staphylococcus haemolyticus in 27.27% followed by MRSA in 10.9%

Figure 2 : Sensitivity pattern in gram positive organisms



Routine antibiotics : BP-Benzyl penicillin,Ox-Oxacillin,T-Tetracycline,G-Gentamicin,Cf-Ciprofloxacin,Lf-Levofloxacin,E-Erythromycin,Cl-Clindamycin,D-Daptomycin,TS-Trimethoprim-sulfamethoxazole,

Restricted antibiotics : V-Vancomycin, Te-Teicoplanin

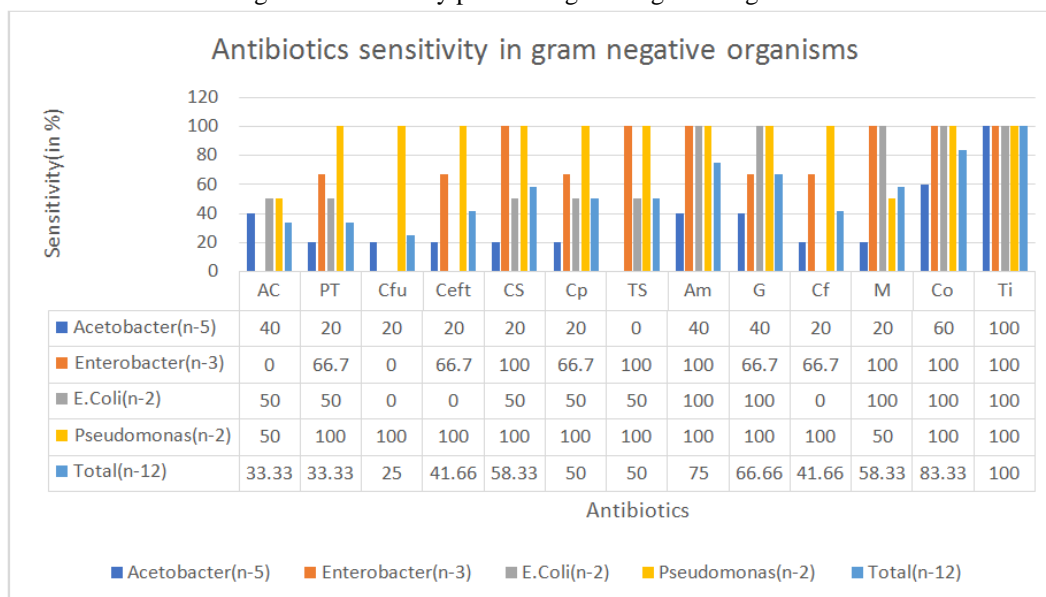
Reserved antibiotics : Ti-Tigecycline,,Li-Linezolid

In our study amongst the routine antibiotics which are used like tetracycline,daptomycin ,gentamicin,penicillin,clindamycin highest sensitivity was found for tetracycline and daptomycin in 92.85% followed by 85.71% strains of gram positive bacteria.

While 96.42% strains of gram positive bacteria were found to be sensitiveto teicoplanin and linezolid which are restricted and reserved drugs in our hospital.

All strains of gram positive bacteria were found to be sensitive to tigecycline.

Figure 3: Sensitivity pattern in gram negative organisms



Routine antibiotics : AC-Amoxicillin-Clavulanic acid, PT-Piperacillin-Tazobactam ,Cfu-Cefuroxime,Ceft-Ceftriaxone,CS-Cefoperazone/Sulbactam,Cp-Cefepime,M- Meropenem ,Am- Amikacin , G- Gentamicin,Cf-Ciprofloxacin,TS – Trimethoprim/Sulfmethoxazole
Reserved antibiotics : T-Tigecycline,Co-Colistin

In our study, sensitivity for amoxicillin-clavulanic and ceftriaxone was 33.3% and 41.66% which are routinely used drugs in our hospital.

There are 83.33% strains of gram negative bacteria which were found to be sensitive to colistin and 100% sensitivity was found for tigecycline.

IV. Discussion

Incidence of surgical site infection in our study was 3.75%. In a study done by Shanbhag ER et al in Karnataka in 2015 the incidence was 7.3%.³ Prajapati V et al reported 8.02% incidence in their study done in Gujarat in 2016.¹⁰ Which was similar to our study.

While in a study done by Sahay N et al in Jodhpur Rajasthan in 2018 the incidence was 0.34% which was lower compared to our study.⁵

Devjani de et al reported 15-20% incidence rate in their study conducted in New Delhi in 2013 which was much higher than our study.⁹

In our study rate of SSI was 41.8% in the age group between 25-29 years of age. In a study done by Sahay N et al rate of SSI was 32.26% in the age group between 25-29 years of age.⁵

This is indicating that risk of SSI increases with age.

In present study 45.45% patients had BMI between 25-29 kg/m² and 18.18% had BMI above 30 kg/m². In a study done by Shanbhag ER et al 62.5% patients with SSI were either obese or overweight.³ Prajapati V et al reported in their study 46.02% cases had BMI above 25 kg/m².¹⁰

It may be due to avascularity of adipose tissue, increase in wound area and poor penetration of antibiotics in adipose tissue.

In our study 25.45% patients underwent preterm LSCS. Rose AF et al reported in their study 9.52% patients underwent pre term LSCS which could be a risk factor for developing SSI as one of the etiology of preterm labour could be infection.⁸

In our study 41.8% had history of previous LSCS. In a study done by Zejnnullahu et al 14.1% had history of previous LSCS.¹ While Sahay N et al reported in their study 51.6% had history of previous LSCS.⁵

This is suggesting that patients with history of previous LSCS could be more prone to developing SSI.

In our study, 34.54% had anemia. Shanbhag et al in their study reported 25% had anemia.³ While in a study done by Zejnnullahu only 4.9% had anemia.¹ which was lower compared to our study.

In our study, 40% had premature rupture of membranes. In a study done by Rose AF et al 73.7% had premature rupture of membranes.⁸ While Sahay N et al reported in their study 64.50% had rupture of membranes before LSCS.⁵ Which is suggesting that premature rupture of membranes is an important risk factor for developing SSI as intact membranes plays protective role against infections.

In our study, 90.9% patients underwent emergency LSCS while 9.09% underwent elective LSCS. In a study done by Sahay N et al 79.03% underwent emergency LSCS. Chhetry et al reported in their study 83% underwent emergency LSCS.⁷ Oslen et al reported in their study 76.5% patients underwent emergency LSCS.²

All findings are similar to our study which indicates that there is high chances of developing SSI in procedures done in emergency may be due to inadequate preparation time as there is threat to either mother or a baby in emergency LSCS.

In our study, 36.3% skin closure was done in subcutaneous manner while 65.45% skin closure was done in vertical mattress manner. In a study done by Shanbhag et al 51% skin closure were done in interrupted manner.³ Sahay N et al reported in their study 75.01% skin closure were done in subcutaneous manner.⁵

This findings suggesting that in a subcutaneous suture more possibility of haematoma formation providing a medium for bacterial proliferation while in vertical mattress closure there may be chances of edema and ischaemia due to tight closure.

In our study, in 89.09% patients nylon was used for skin closure while in 10.09% polyglactin was used.

Suture material may be associated factor for developing SSI more research can be done in this aspect.

In our study, 25.45% patients required resuturing. In a study done by Sahay N et al 32.26% required resuturing.⁵

In our study most common pathogen found was staphylococcus haemolyticus in 27.27% patients followed by MRSA in 10.9%. Sahay et al reported in their study in 33.82% patients coagulase negative staphylococcus isolated.⁵ In a study done by Zejnnullahu et al staphylococcus aureus was most frequent isolated organism in 28.1% patients.¹ Chhetry et al reported in their study most important pathogen isolated was staphylococcus aureus in 82.9% patients.⁸ Devjani de et al reported in their study common isolate was acinetobacter species in 32.03%.⁹

V. Conclusion

Identifying modifiable risk factors responsible for SSI, reporting of SSI and policy to prevent SSI and standard surgical techniques are necessary steps to reduce incidence of surgical site infection and emerging antibiotic resistance and providing quality care to women.

Our study indicated that anemia, obesity, antenatal risk factors like premature rupture of membranes, preterm and emergency LSCS were associated with increasing rate of SSI. We should be more vigilant about pre-operative preparation during emergency LSCS.

In our study, the most common pathogen isolated was *Staphylococcus haemolyticus* which is coagulase negative, part of skin flora at the axillae, perineum and inguinal areas.

In our study, sensitivity for amoxicillin-clavulanic acid and ceftriaxone was 33.3% and 41.66% which are routinely used drugs in our hospital. 96.42% strains of gram positive bacteria were found to be sensitive to teicoplanin and linezolid which are restricted and reserved drugs in our hospital. This suggests emerging resistance against reserved and restricted antibiotics.

There has to be routine scrutiny for sensitivity pattern of commonly used antibiotics to common pathogen and antibiotic policy to be modified as per sensitivity pattern. It is very necessary to use antibiotics judiciously to prevent emerging antibiotic resistance.

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