

# Prevalence of surgical site infection following cesarean delivery and their associated risk factors: A hospital-based Cross-sectional study

Dr. Tarannum Afiya Salma<sup>1\*</sup>, Dr. Narendra Patil<sup>2</sup>, Dr. Shital Lad<sup>3</sup>

<sup>1</sup>Jr3, Government Medical College and Hospital Jalgaon, Maharashtra, INDIA.

<sup>2</sup>Assistant Professor, Government Medical College and Hospital, Chhatrapati Sambhajnagar, INDIA.

<sup>3</sup>HOD, Government Medical College and Hospital Jalgaon, INDIA.

Email: [afiyatarannum1@gmail.com](mailto:afiyatarannum1@gmail.com)

## Abstract

**Background:** Surgical site infections are the second most common among healthcare associated infections after urinary tract infections. The SSI rates after caesarean section are reported within the range from 3% to 15%, depending on the methods and intensity of surveillance used to identify infections, the patient population, and the use of antibiotic prophylaxis. **Aim And Objectives:** 1. Prevalence of surgical site infection following cesarean delivery and their associated risk factors: A hospital-based Cross-sectional study. 2 To find out the risk factors associated with Surgical Site Infections. 3. Study the clinical profile of Surgical site infections following Caesarean Section **METHODS:** Study Design: Hospital based, cross-sectional study. Study Setting: Department of OBGY Government medical college and hospital Jalgaon. Study population: The study was conducted on All women who delivered by Caesarean Section in a Government medical college and hospital Jalgaon. Sample size: 200. **Results:** majority of cases were from 25-30 years age group 128 followed by 34 cases found in 31-35 years age group, 26 cases observed in 18-24 years age group and 12 cases reported in >35 years age group. most of the cases were Multipara contributing 127 (63.5%) and 73 (36.5%) were Primipara. majority of cases were from  $\geq 37$  weeks of gestational age contributing 167 (83.5%) and 33 cases from < 37 weeks of gestational age (16.5%). majority of cases Emergency CS done in 169 cases (84.5%) and 31 cases Elective CS (15.5%). 69 cases found with Anaemia, 43 cases presented with obesity (21.5%) followed by 27 cases diagnosed with DM (13.5%) and 15 cases with HTN (7.5%), heart disease 11, chronic liver disease 7 and kidney disease 4. Association of DM with Organ/space SSI was statistically significant at  $p < .05$ . **Conclusions:** Majority of cases were from 25-30 years age group, Most of the cases were Multipara, Maximum of cases were from  $\geq 37$  weeks of gestational age, Prevalence of SSI among CS cases was 10.07%, Majority of SSI found in Emergency CS, Majority of cases found with Superficial incisional SSI, Association of DM with Organ/space SSI was statistically significant at  $p < .05$ .

**Keywords:** Surgical site infections, Risk factors, Etiopathogenesis, Comorbidity, Caesarean section..

## \*Address for Correspondence:

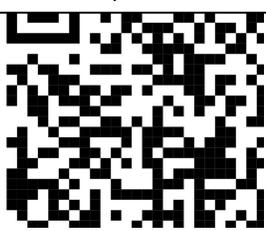
Dr Tarannum Afiya Salma<sup>1</sup>, Jr3, Government Medical College and Hospital Jalgaon, Maharashtra, INDIA.

Email: [afiyatarannum1@gmail.com](mailto:afiyatarannum1@gmail.com)

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## INTRODUCTION

Surgical site infections (SSI) are the second most common among healthcare associated infections after urinary tract infections (UTI).<sup>[1]</sup> The SSI rates after caesarean section are reported within the range from 3% to 15%, depending on the methods and intensity of surveillance used to identify infections, the patient population, and the use of antibiotic prophylaxis.<sup>[2-4]</sup>

The SSI following caesarean section causes delayed recovery, prolonged hospitalization, necessitate readmission, increase antibiotic use as well as other patient morbidities and mortality thus increasing physical, psychological, and economic burden to

woman, her family and to the medical authorities. The risk of surgical site infection (SSI) may depend on various patient risk factors as well as sterile technique and adequate hemostasis during surgery and post-operative wound care.<sup>[5-6]</sup>

Many different risk factors for SSIs following LSCS have been reported. In decreasing order of significant risk as measured by relative risks or odds ratios, risk factors include subcutaneous hematoma, chorioamnionitis, maternal comorbidities (American Society of Anesthesiologists class of 3 or greater), tobacco use in pregnancy, incision length > 16.6 cm, limited prenatal care (fewer than 7 visits).

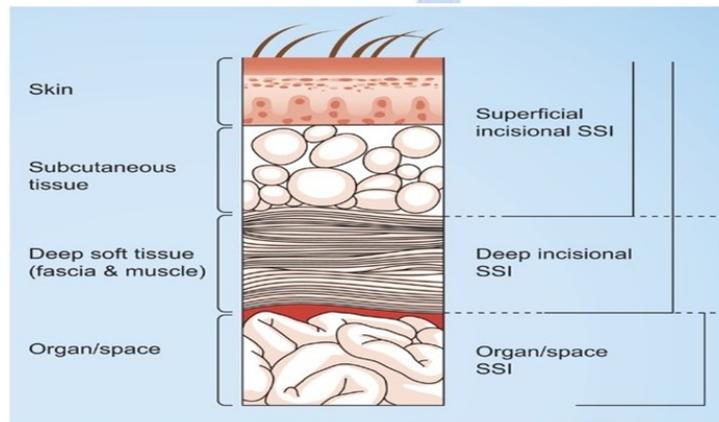
Body mass index >30 or 35 kg/m<sup>2</sup> corticosteroid use, subcutaneous tissue thickness > 3 cm, prolonged second stage (compared with first stage), teaching service, no antibiotic prophylaxis, pregestational diabetes, operating time ≥ 38 min, hypertensive disease/preeclampsia, duration of labor >12 h, nulliparity, twin gestations, premature rupture of membranes, gestational diabetes, blood loss (increased for every increase in blood loss of 100 mL), previous cesarean delivery, emergency delivery, and rupture of membranes (increased risk for every additional hour).<sup>[7]</sup>

**Need for the study**

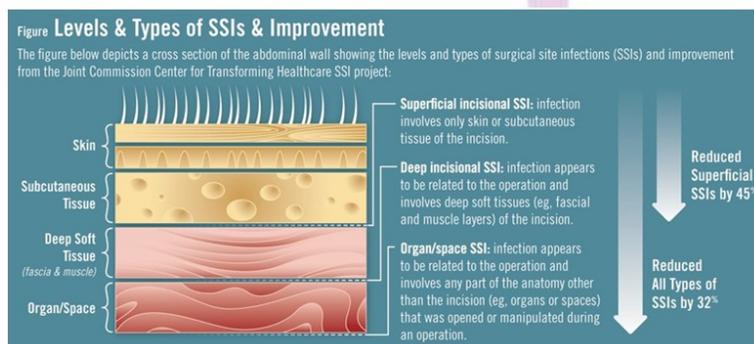
Surgical site infection (SSI) is one of the most common complications following cesarean section, and has an incidence of 3%–15%. It places physical and emotional burdens on the mother herself and a significant financial burden on the health care system. Moreover, SSI is associated with a maternal mortality rate of up to 3%. With the global increase in cesarean section rate, it is expected that the occurrence of SSI will increase in parallel, hence its clinical significance.

Given its substantial implications, recognizing the consequences and developing strategies to diagnose, prevent, and treat SSI are essential for reducing post cesarean morbidity and mortality. Optimization of maternal comorbidities, appropriate antibiotic prophylaxis, and evidence-based surgical techniques are some of the practices proven to be effective in reducing the incidence of SSI.

Few studies conducted in Maharashtra regarding Prevalence of surgical site infection following cesarean delivery and their associated risk factors so I am interested to study to the prevalence of Surgical Site Infections (SSI) following Caesarean Section and risk factors associated with Surgical Site Infections.



**Figure 1: Classification of Surgical site infections after cesarean section**



**Figure 2: Levels and Types of Surgical site infections and Improvement**

## OBJECTIVES:

1. Prevalence of surgical site infection following cesarean delivery and their associated risk factors.
2. To find out the risk factors associated with Surgical Site Infections.
3. Study the clinical profile of Surgical site infections following Caesarean Section

## MATERIAL AND METHODS

**Study Design:** Hospital based, cross-sectional study.

**Study Setting:** Department of OBGY Government medical college and hospital Jalgaon.

**Study population:** The study was conducted on All women who delivered by Caesarean Section in a Government medical college and hospital Jalgaon. **Sample size:** 200

**Sampling method:** Convenient sampling method

### Inclusion Criteria:

1. All women who undergo caesarean Delivery during the study period with diagnosis of SSI within 30 days of caesarean section such cases were included.

### Exclusion Criteria:

1. Cases of SSI with caesarean section performed elsewhere and referred to our hospital
2. Not willing to participate

### Inclusion for the study:

Written approval from Institutional Ethics committee was obtained beforehand. Written approval of OBGY and other related department was obtained. After obtaining informed verbal consent from all patients coming to our institute during study period according to exclusion and inclusion criteria admitted to OBGY ward of GMC Jalgaon such cases were included in the study.

### Sampling technique

Convenient sampling technique used for data collection. All patients admitted in OBGY ward of GMC Jalgaon from 1<sup>st</sup> December 2023 to 30<sup>th</sup> November 2025

### Methods of Data Collection and Questionnaire-

Pre-designed and pretested questionnaire was used to record the necessary information. Questionnaires included general information, such as age, sex, Medical history- chief complain, past history, general examination, systemic examination.

Menstrual history: LMP, EDD, Obstetrics history-marriage duration, parity, Mode of delivery, maternal complications, Type of meconium, No ANC visits, Gestational age at the time of admission, Mode of delivery, Maternal Outcome, Maternal complications, perinatal outcome, perinatal complication.

Details of their age, parity, gestational age & clinical features at presentation, detailed history of current pregnancy and previous pregnancies, history of warning bleeding etc are documented. Women are subjected to a detailed clinical examination.

Detailed history of patients and their chief complaints was recorded. Age, parity, gestational age, menstrual history, obstetric histories was noted along with family history of multiple pregnancies if any. Obstetric complications like Pregnancy induced hypertension, anaemia, preterm labor, Intrauterine growth restriction, Premature rupture of membranes was studied.

Mode of delivery was recorded. Fetal outcome, gestational age at birth, weight at birth, APGAR scores and requirement for NICU admission was analyzed. Patients was managed according to standard protocol. LSCS done for obstetric indication. Duration of hospital stay, history of any chronic illness, details of antimicrobial intake - regarding timing, dose and frequency of pre-op antibiotics was recorded in the proforma.

Suture site was evaluated for development of SSI on 3rd day and thereafter till discharge. Details were recorded for appearance of signs and symptoms of SSI like fever, localized pain, swelling, induration, dehiscence, or purulent discharge from suture site.

SSI's was classified as superficial, deep and organ space as per Centre for Disease Control and prevention (CDC) definitions. Diagnosis of cellulitis and bloody discharge was not included in the criteria for SSI diagnosis. All the cases that either during follow up visits in OPD or re-admission due to post-surgical sepsis within 30 days post-operatively was included in the study.

Data was compiled for these cases from OPD dressing register, OT register and treatment register. Details of all post-caesarean patients who attended OPD for stitch removal or who was readmitted and managed in OT following post-caesarean sepsis, found with clinical features of SSI were recorded from the OPD register and OT records respectively on daily basis during the study period. Purulent discharge, if any, from the incision site was subjected to culture and susceptibility testing before administration of antibiotics.

### Operational Definitions:

1. **Post caesarean section Surgical Site Infection:** An infection which is developed after caesarean delivery on the operational site which is diagnosed by clinician.

2. **Prolonged hospital stay;** defined as hospital stay lasting more than 7 days.
3. **Prolonged operation time;** defined as caesarean section lasting more than one hour from skin incision to last skin stitch.

**Data entry and statistical analysis:**

The data were entered in Microsoft Excel and data analysis was done by using SPSS demo version no 21 for windows. The analysis was performed by using percentages in frequency tables and  $p < 0.05$  was considered as level of significance using the Chi-square test.

**RESULT AND OBSERVATIONS**

The present Hospital based cross sectional study conducted on All women who undergo caesarean Delivery during the study period with diagnosis of SSI within 30 days of caesarean section such cases were included.

**Table No.1: Distribution of cases as per age (n=200)**

Age (in Years)	Frequency	Percentage
18-24	26	13%
25-30	128	64%
31-35	34	17%
>35	12	6%
<b>Total</b>	<b>200</b>	<b>100%</b>

Above table shows that, majority of cases were from 25-30 years age group 128 followed by 34 cases found in 31-35 years age group, 26 cases observed in 18-24 years age group and 12 cases reported in >35 years age group.

**Table No.2: Distribution of cases according to parity and Gestational age (n=200)**

Parity	Frequency	Percentage
Primipara	73	36.5%
Multipara	127	63.5%
<b>Total</b>	<b>200</b>	<b>100%</b>
Gestational age (weeks)	Frequency	Percentage
< 37 wks.	33	16.5%
≥ 37 wks.	167	83.5%
<b>Total</b>	<b>200</b>	<b>100%</b>

Above table shows that, most of the cases were Multipara contributing 127 (63.5%) and 73 (36.5%) were Primipara. majority of cases were from ≥ 37 weeks of gestational age contributing 167 (83.5%) and 33 cases from < 37 weeks of gestational age (16.5%)

**Table No.3: Prevalence of SSI among CS cases**

Prevalence of SSI	Frequency	Percentage
SSI	200	10.07%
No	1787	89.93%
<b>Total</b>	<b>1987</b>	<b>100%</b>

The above table shows Prevalence of SSI among CS cases was 10.07%. A Total 1987 Caesarian section done in Hospital during study and found 200 SSI cases (10.07%)

**Table No.4: Distribution of cases as per Type of CS (n=200)**

Type of CS	Frequency	Percentage
Elective CS	31	15.5%
Emergency CS	169	84.5%
<b>Total</b>	<b>200</b>	<b>100%</b>

The above table shows majority of cases Emergency CS done in 169 cases (84.5%) and 31 cases Elective CS (15.5%)

**Table No.5: Distribution of cases as per Risk factors (n=200)**

Risk Factors	Frequency	Percentage
DM	27	13.5%
HTN	15	7.5%
Obesity	43	21.5%
Anemia	69	34.5%
Heart disease	11	5.5%
chronic liver Disease	07	3.5%
Kidney disease	04	02%
<b>Total</b>	<b>200</b>	<b>100%</b>

The above table shows 69 cases found with Anemia, 43 cases presented with obesity (21.5%) followed by 27 cases diagnosed with DM (13.5%) and 15 cases with HTN (7.5%), Heart disease 11, chronic liver disease 7 and Kidney disease 4.

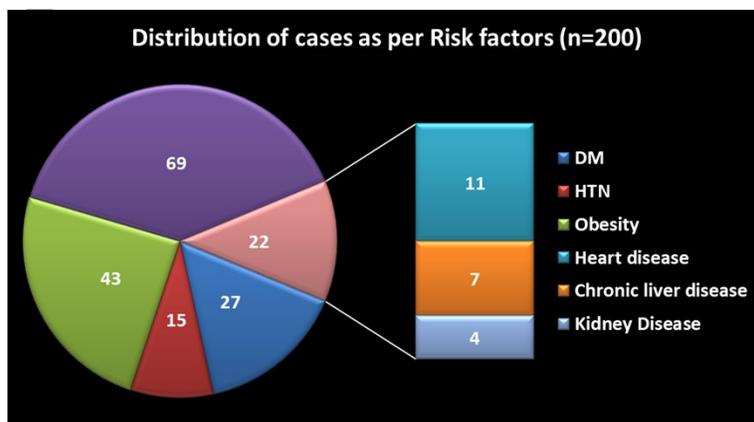


Figure No.1: Distribution of cases as per Risk factors (n=200)

Table No.6: Distribution of cases as per Type of SSI (n=200)

Type of SSI	Frequency	Percentage
Superficial incisional SSI	98	49%
Deep incisional SSI	60	30%
Organ/space SSI	42	21%
<b>Total</b>	<b>200</b>	<b>100%</b>

The above table shows majority of cases found with Superficial incisional SSI 98 (49%) followed by Deep incisional SSI 60 cases (30%) and 42 cases found with Organ/space SSI (21%)

Table No.7: Association of DM with SSI (N=200)

DM	Organ/space SSI				Total N=200	
	Present		Absent		N	%
	N	%	N	%	N	%
Yes	26	96.29	01	3.71	27	13.5
No	16	9.24	157	90.76	173	86.5
<b>TOTAL</b>	<b>42</b>	<b>21</b>	<b>158</b>	<b>79</b>	<b>200</b>	<b>100</b>

The Chi-square statistic is 106.6715. The p-value is .000001  
Association of DM with Organ/space SSI was statistically significant at p<.05.

## DISCUSSION

This Hospital based cross sectional study conducted in Tertiary care hospital 200 SSI cases after CS included in the study. In current study majority of cases were from 25-30 years age group 128 followed by 34 cases found in 31-35 years age group, 26 cases observed in 18-24 years age group and 12 cases reported in >35 years age group. Similar result found in the study conducted by Gupta S et al. (2021)<sup>[8]</sup> He reported that the mean age was 27.5 years ± 5.8. Gomaa et al<sup>[9]</sup> He reported that the most cases found in 20-34 years age group 678 (81.90%) followed by 87 in <19 years group (10.50%) and 63 (7.60%) cases in >35 age group. Vijaya K et al., (2015)<sup>[10]</sup> The mean age among cases of elective LSCS is 25 years. The mean age among cases of CS is 24 years.

In current study most of the cases were Multipara contributing 127 (63.5%) and 73 (36.5%) were Primipara. Gomaa et al<sup>[9]</sup> He reported that the

most cases observed with multipara 716 (86.50%) and Primipara 112 (13.50%)

In current study majority of cases were from ≥ 37 weeks of gestational age contributing 167 (83.5%) and 33 cases from < 37 weeks of gestational age (16.5%). Gomaa et al<sup>[9]</sup> He reported that the most cases found with ≥ 37 weeks of gestational age contributing 689 (83.20%) and 139 (16.80%) cases from < 37 weeks of gestational age.

In current study Prevalence of SSI among CS cases was 10.07%. A Total 1987 Caesarian section done in Hospital during study and found 200 SSI cases (10.07%). Similar result found in the study conducted by Gupta S et al., (2021)<sup>[8]</sup> The SSI rate was found to be 10.3 per 100 surgeries. Zaineb S et al., (2021)<sup>[11]</sup> He reported that the prevalence of SSI was 15 (4.4%).

Mhaske G et al., (2020)<sup>[12]</sup> He revealed that the prevalence of SSI was 4.4%. Zejnnullahu VA et al., (2019)<sup>[13]</sup> He found that the prevalence of SSI was 9.85%. AlJama FE (2012)<sup>[14]</sup> studied incidence of post

caesarean wound infection and independent risk factors associated with wound infection. The overall wound infection rate in the study was 4.2% among 2 541 lower transverse CS.

In current study majority of cases Emergency CS done in 169 cases (84.5%) and 31 cases Elective CS (15.5%). Sahay N et al., (2020)<sup>[15]</sup> He found that the Emergency CS in 79.03% cases and 20.97% Elective CS. Gomaa et al<sup>[9]</sup> He reported that the Emergency CS in 672 (81.20%) cases and Elective CS in 156 (18.80%) cases. Dhar H et al <sup>[16]</sup> He reported that the A high proportion of SSI (25.2%) has been reported in emergency CS when compared to 7.6% in elective cases

In current study 69 cases found with Anaemia, 43 cases presented with obesity (21.5%) followed by 27 cases diagnosed with DM (13.5%) and 15 cases with HTN (7.5%), Heart disease 11 , chronic liver 7 and Kidney disease 4. Gomaa et al<sup>[9]</sup> He reported that the 136 (16.40%) cases found with obesity, DM in 83 (10%) and HTN in 41(5%) cases.

In current study majority of cases found with Superficial incisional SSI 98 (49%) followed by Deep incisional SSI 60 cases (30%) and 42 cases found with Organ/space SSI (21%). Association of DM with Organ/space SSI was statistically significant at  $p < .05$ . Similar result observed in the study conducted by Gomaa et al<sup>[9]</sup> He reported that the most of cases found with Superficial incisional SSI 390 (47.10%) followed by Deep incisional SSI 232 cases (28%) and 206 cases found with Organ/space SSI (24.9%).

## CONCLUSIONS

Majority of cases were from 25-30 years age group, Most of the cases were Multipara, Maximum of cases were from  $\geq 37$  weeks of gestational age, Prevalence of SSI among CS cases was 10.07%., Majority of SSI found in Emergency CS, Majority of cases found with Superficial incisional SSI, Association of DM with Organ/space SSI was statistically significant at  $p < .05$ .

## BIBLIOGRAPHY

1. Smaill FM, Gyte, Gml. Antibiotic prophylaxis versus no prophylaxis for preventing infection after caesarean section. Cochrane Database Syst Rev 2014 Oct 28;10:CD007482.
2. Killian CA, Graffunder EM, Vinciguerra TJ, Venezia RA. Risk factors for surgical-site infections following caesarean section. Infect Control Hosp Epidemiol 2001; 22:613–7.

3. Johnson A, Young D, Reilly J. Caesarean section surgical site infection surveillance. J Hosp Infect 2006;64: 1–6.
4. Shrestha S, Shrestha R, Shrestha B, Dongol A. Incidence, and risk factors of surgical site infection following caesarean section at dhulikhel hospital. Kathmandu Univ Med J 2014;46(2):113–6.
5. Olsen MA, Butler AM, Willers DM, Devkota P, Gross GA, Fraser VJ. Risk factors for surgical site infection after low transverse caesarean section. Infect Control Hosp Epidemiol 2008; 9:477–84.
6. Gur R, Duggal SD, Rongpharpi SR, Srivastava R, Kumar A, Gupta V, et al. Post caesarean surgical site infections. Arch Clin Microbiol [Internet] 2015 [cited 2024 Feb 15];6(1). Available from: <https://researcher.manipal.edu/en/publications/post-caesarean-surgical-site-infections>
7. Kawakita T, Landy HJ. Surgical site infections after caesarean delivery: epidemiology, prevention, and treatment. Kawakita and Landy Maternal Health, Neonatology, and Perinatology. 2017; 3:12.
8. Gupta S, Manchanda V, Sachdev P, Saini RK, Joy M. Study of incidence and risk factors of surgical site infections in lower segment caesarean section cases of tertiary care hospital of north India. Indian Journal of Medical Microbiology. 2021 Jan 1;39(1):1-5.
9. Gomaa et al. BMC Pregnancy and Childbirth (2021) 21:634 <https://doi.org/10.1186/s12884-021-04054-3>
10. Vijaya K, Padmaja A, Poreddy A, Vivekanand N. Surgical Site Wound Infection in Emergency and Elective LSCS – A Comparative Study. Sch. J. App. Med. Sci., 2015; 3(9D):3412-3417.
11. Zaineb S, Akbar A, Ikram M, Mahboob S, Mahmood A, Khan AW. Incidence and risk factors for maternal surgical site infection after caesarean section. Professional Med J 2021; 28(10):1495-1500.
12. Mhaske G, Vadehra P, Junnare K, Kalra K. Study of surgical site infection (SSI) in patients undergoing caesarean section (CS): A retrospective study. International Journal of Clinical Obstetrics and Gynaecology. 2020; 4(1): 350-353.
13. Zejnnullahu VA, Isjanovska R, Sejffija Z, Zejnnullahu VA. Surgical site infections after caesarean sections at the University Clinical Center of Kosovo: rates, microbiological profile and risk factors. BMC Infectious Diseases. 2019; 19:752.
14. Al Jama FE. Risk factors for wound infection after lower segment caesarean section, Qatar Medical Journal. 2012;2;26-32.
15. Sahay N, Jhakhar R. Study of post caesarean section wound infection and microbiological epidemiology in tertiary care centre, Western Rajasthan, India. Int J Reprod Contracept Obstet Gynecol 2020; 9:2042-6.
16. Dhar H et al. (2014) A study of post-caesarean section wound infections in a regional referral hospital, Oman. Sultan Qaboos University Medical Journal 14, e211–e217.

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