



A STUDY ON INCIDENCE OF POST CESAREAN SECTION SURGICAL SITE INFECTION (SSI) AND THE RISK FACTORS ASSOCIATED WITH IT IN A HOSPITAL BASED STUDY.

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ABSTRACT **Introduction:** Surgical site infection (SSI) is one of the most common complications following cesarean section (CS), and has an incidence of 3-15%. With the global increase in CS rate, it is expected that the occurrence of SSI will increase in parallel, hence its clinical significance. Our study was conducted to ascertain the frequency and identify the risk factors associated with SSI. **Methods:** This retrospective study was conducted at Dev Hospital, Bodeli. About 340 mothers were subjected to CS during the considered timeframe, whose demographic characteristics, relevant history and obstetric data were analysed. Also the data regarding the duration of stay at the hospital, next follow-up at 1 month after delivery, and any occurrence of SSI and other medical complications were analysed. **Results:** The incidence of SSI was 5.9%. The procedures lasted >30 minutes (80.0%) in majority of those who developed SSI, while among those without SSI, majority of procedures were completed in under 30 minutes (71.9%). The proportion of mothers with less ANC visits, positive history of GDM and severe anemia was significantly more among mothers with SSI, comparatively. The complications such as chorioamnionitis and MSL were more evident among mothers with SSI. Only 1 case out of 20 mothers (5.0%) with SSI needed resuturing, while majority of others were conservatively managed with just antibiotics and dressing (95.0%). **Conclusion:** The incidence of post-CS SSI was relatively high in the study settings. Screening for pre-operative anemia and appropriate correction before surgery, community counseling about antenatal visits and identify high risk mothers.

KEYWORDS : Incidence, Risk Factors, Cesarean Section, Surgical Site Infection

INTRODUCTION:

Cesarean delivery is a major obstetrical surgical procedure aiming to save the lives of mothers and fetuses.¹ The incidence of cesarean deliveries, both repeat and primary, has risen dramatically over the last few decades, with an estimated global number of 22.9 million cesarean deliveries in 2012.^{2,3} As a surgical procedure, cesarean delivery may be accompanied by a number of complications, surgical site infection (SSI) being one of them.

The rate of SSI ranges from 3% to 15% worldwide. In India, based on the observations from recent studies, the incidence of infection was estimated to be between 5% and 10%.^{4,5} The variation in incidence may reflect differences in population characteristics and risk factors, perioperative practices, and the duration from the procedure until ascertainment.

Many studies have proposed multiple risk factors that would result in post cesarean SSI which includes subcutaneous hematoma, chorioamnionitis, maternal comorbidities (such as gestational diabetes or hypertension), tobacco use in pregnancy, wider incision length, limited prenatal care (fewer ANC visits), corticosteroid use, longer operating time, nulliparity, rupture of membranes, increased blood loss, previous cesarean delivery, and emergency delivery.⁶⁻⁸

However, the risk for developing SSI has significantly decreased in the recent years, mainly owing to improvements in hygiene conditions, antibiotic prophylaxis, sterile procedures, and other practices.⁹ Despite this decrease, the occurrence of SSI is expected to increase given the continuous rise in the incidence of cesarean deliveries, which in turn may increase maternal morbidity and mortality.¹⁰ It may also prolong maternal hospitalization, increase health care costs, and lead to other socioeconomic implications. Thus our study was conducted with the objectives of estimating the incidence of SSI following cesarean section, and to determine the risk factors associated with it.

METHODS:

Our study with retrospective design was conducted under the department of Obstetrics and Gynecology of Dev Hospital, Bodeli. The study considered all the mothers who delivered live child through cesarean section irrespective of the requirement of emergency, between January 2021 and July 2023. Out of this, 340 mothers were included for analysis based on the inclusion criteria of the study.

The basic demographic characteristics, relevant history and obstetric data were collected from each patient. The mothers in the study had delivered the child through cesarean section either as an emergency procedure or as planned as an elective procedure, after necessary examinations and investigations. Relevant observations during the procedure were also noted. The details regarding the duration of stay at

the hospital as per their improvement, further follow-up at 1 month after delivery, and incidence of SSI or any other medical complications were collected.

The information collected regarding all the selected cases was recorded in Microsoft excel. Continuous data was represented in terms of means and standard deviations, and the categorical data in frequencies and proportions. Statistical Software SPSS version 26 was used to analyze the data and interpret the findings. Appropriate tests of significance were used based on the type of data. P-value of <0.05 was considered as statistically significant after assuming all the rules of statistical tests.

RESULTS

On observation, 20 out of 340 cases developed infection at the site of caesarean incision, which accounts to the incidence rate of 5.9% (Figure 1). Further analysis were conducted with respect to the occurrence of SSI.

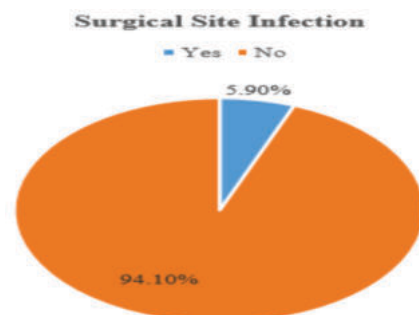


Figure 1: Incidence of surgical site infection post caesarean section

Majority of the mothers belonged to the age group of 21-35 years. Most were multigravida, with gestational age more than 37 weeks, irrespective of the occurrence of SSI. Such that, there exists no significant association of SSI with respect to the characteristics of the subjects, thereby suggesting that the patient demographics and characteristics do not play a decisive role in determining the likelihood of SSI (Table 1).

Table 1: Association of incidence of SSI with basic demographic and obstetric characteristics of the subjects

Subjects (N=340)	Surgical Site Infection				p-value#
	Yes (N=20)		No (N=320)		
	N	%	N	%	
Age group <20 years	0	0.0%	10	3.2%	0.389

	21-35 years	19	95.0%	305	95.3%	
	>35 years	1	5.0%	5	1.5%	
Parity	Primi	6	30.0%	103	32.2%	0.838
	Multi	14	70.0%	217	67.8%	
Gestational Age	≤37 weeks	3	15.0%	21	6.6%	0.152
	>37 weeks	17	85.0%	299	93.4%	
ANC visits	No	3	15.0%	8	2.5%	0.008*
	1-3	2	10.0%	25	7.8%	
	≥4	15	75.0%	287	89.7%	
PIH	Yes	2	10.0%	9	2.8%	0.078
	No	18	90.0%	311	97.2%	
GDM	Yes	1	5.0%	2	0.6%	0.042*
	No	19	95.0%	318	99.4%	
Anemia	<7 g/dL	3	15.0%	3	0.9%	<0.001*
	7-8.9 g/dL	1	5.0%	21	6.6%	
	9-10.9 g/dL	16	80.0%	296	92.5%	

Chi-square test

* Statistically significant

On enquiring the mothers, we meticulously documented their maternal history, including any recorded morbidity events. Notably, among the subjects who developed SSI, we observed that 25.0% of cases had fewer than 4 antenatal care (ANC) visits, while 10.0% experienced pregnancy-induced hypertension (PIH), and 5.0% had gestational diabetes mellitus (GDM). Also, the anemia was severe with Hb levels less than 7 g/dL in 15.0% cases. All these proportions were higher in comparison with those who did not develop SSI. Especially, the significant association of SSI was established statistically with respect to ANC visits, GDM and Anemia, thereby depicting that SSI was more common among those with fewer ANC visits, and history of GDM and severe anemia (Table 1).

Majority underwent emergency LSCS, with blood loss levels consistently below 1000 mL, regardless of the occurrence of SSI. However, when we assessed the duration of the surgical procedure, it was evident that a significant proportion of those who developed SSI had undergone procedures lasting more than 30 minutes. In contrast, among those who did not develop SSI, the majority of procedures were completed in under 30 minutes. This discrepancy in surgical durations was found to be statistically significant, suggesting that a longer duration of LSCS is associated with an increased chances of SSI (Table 2).

All mothers in the study received diligent monitoring to detect the occurrence of any delivery-related complications, including chorioamnionitis and meconium-stained liquor. Upon analysis, chorioamnionitis was evident in 10.0% cases with SSI, while meconium stained liquor was present during delivery of 55.0% neonates born to mothers with SSI. In contrast, among mothers who did not develop SSI, the incidence of chorioamnionitis and meconium-stained liquor was significantly lower at 1.2% and 17.8%, respectively. Our study yielded statistically significant associations in these regards, confirming that the occurrence of SSI was notably more prevalent when chorioamnionitis and meconium-stained liquor were evident (Table 2).

Table 2: Association of incidence of SSI with surgical parameters and complications

Subjects (N=340)		Surgical Site Infection				p-value#
		Yes (N=20)		No (N=320)		
		N	%	N	%	
Type	Emergency	17	85.0%	222	68.7%	0.137
	Elective	3	15.0%	98	31.3%	
Duration	≤30 minutes	4	20.0%	230	71.9%	<0.001*
	>30 minutes	16	80.0%	90	18.1%	
Bleeding	≤1000 mL	18	90.0%	309	96.6%	0.137
	>1000 mL	2	10.0%	11	3.4%	
Chorio-amnionitis	Yes	2	10.0%	4	1.2%	0.003*
	No	18	90.0%	316	98.8%	
MSL	Yes	11	55.0%	57	17.8%	<0.001*
	No	9	45.0%	263	82.2%	

Chi-square test

* Statistically significant

Overall, fewer ANC visits, presence of GDM and severe anemia, longer procedure (>30 minutes), occurrence of chorioamnionitis and meconium stained liquor were determined as the risk factors contributing to the incidence of SSI in our study.

Among 20 cases who developed infection at the site of caesarean incision, majority were conservatively managed with just antibiotics and dressing (95.0%). Only 1 case (5.0%) needed resuturing at the surgical site. None required exploratory laparotomy in our study (Figure 2).

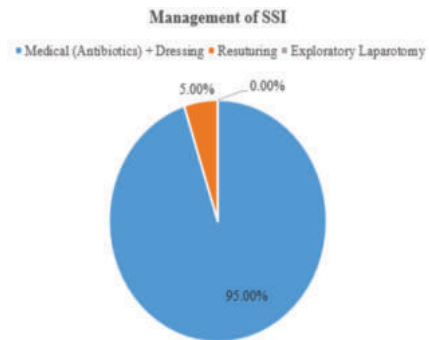


Figure 2: Management of surgical site infection post caesarean section

DISCUSSION:

The number of cesarean sections performed is being escalated worldwide and especially in India. Surgical Site Infection following cesarean section is one of the most common obstetric complications, which often causes massive burdens on both the mother and the health care system and it is associated with high morbidity and mortality. Thus our study was conducted encompassing a cohort of 340 mothers scheduled for cesarean section, with the primary objectives of ascertaining the frequency and identifying the risk factors associated with surgical site infections.

The incidence of SSI in our study was estimated to be 5.9%. This incidence was comparable with a previous study conducted at S.S.G. Hospital, Baroda, in the year 2022 by Hirani S et al¹¹, which was 5.63%. However, on considering the studies beyond past 5 years, the incidences were quite higher in comparison, which accounts for 7.84% (Pathak A et al¹²), 10.3% (Gupta S et al¹³), 12.6% (Shrestha S et al¹⁴) and 24.2% (De D et al¹⁵). This difference might be attributed to the difference in the quality of both surgical care provisions and services. Also the differences between studies in time period, sample size, settings and duration play an important role in these variations. One thing which must be considered is that the incidence has reduced significantly over the period of time.

Our study found that ANC visits less than 4, presence of GDM and severe anemia, longer procedure (>30 minutes), occurrence of chorioamnionitis and meconium stained liquor were the risk factors that could contribute to the occurrence of SSI. Various Indian studies in the recent past have proposed multiple risk factors which are synchronous with our observations.

Study by De D et al¹⁵, had deduced by multivariate logistic regression that premature rupture of membrane (PROM), antibiotics given earlier than 2 hours and increased duration of stay in the hospital were found to be significant risk factors of SSI. Another study by Shrestha S et al¹⁴ had observed that SSI was common in women who had rupture of membrane before surgery, who underwent emergency surgery, and who had vertical skin incision and interrupted skin suturing during surgery, with statistical significance.

Pathak A et al¹² had identified that increased maternal age, vaginal examination, presence of vaginal discharge, medical disease, concurrent surgical procedure, and increase in hour of surgery, inappropriate antibiotic prophylaxis and increase in stay in the hospital after the surgery increased the risk of contracting an SSI. Gupta S et al¹³ concluded in their North Indian study that inappropriate pre-surgical antibiotic prophylaxis, anaemia, previous LSCS, intra-operative blood transfusion and comorbid illness like heart disease, hypothyroidism, chronic liver and kidney disease were found to be significantly

associated with SSI.

Thus studies such as Gur R et al¹⁶ and Dahiya P et al¹⁷ had stressed more on careful pre-, inter- and post-surgical prevention of SSI and management of associated risk factors, with stringent infection control practices in the operation room can help to achieve minimal infection rates in patients undergoing caesarean section deliveries. Also the prophylactic antibiotics should be chosen principally on the basis of efficacy against the usual exogenous and endogenous microorganisms known to cause infectious complication in each clinical setting, as well as their safety profile and cost.

CONCLUSION:

The incidence of post-CS SSI was relatively high in the study settings. Fewer ANC visits, presence of GDM and severe anemia, longer procedure (>30 minutes), occurrence of chorioamnionitis and meconium stained liquor were determined as the risk factors contributing to the incidence of SSI in our study. Thus, screening for pre-operative anemia and appropriate correction before surgery, community counseling about antenatal visits and identify high risk mothers. Management of SSI was mainly medical but surgical approach may be needed in some cases.

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Declarations

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Conflict of interest: None declared

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