

Prospective Study of Risk Factors for Post LSCS Surgical Site Infection at Tertiary Care CenterMona D. Gandhi¹, Nalini I. Anand², Trupti C. Nayak³, Nayan I Paraliya^{4*}¹Associate Professor and Head of Unit, Department of Obstetrics & Gynaecology, M P Shah Government Medical College, Jamnagar, Gujarat, India²Professor and HOD, Department of Obstetrics & Gynaecology, M P Shah Government Medical College, Jamnagar, Gujarat, India³Associate Professor and HOU, Department of Obstetrics & Gynaecology, M P Shah Government Medical College, Jamnagar, Gujarat, India⁴Resident, Department of Obstetrics & Gynaecology, M P Shah Government Medical College, Jamnagar, Gujarat, India

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Corresponding Author: Dr Nayan I Paraliya

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Abstract:

Surgical site infection is one of the most common complications Following Cesarean section and has an incidence of 3% -15%. It places physical and emotional Burden on the mother herself and significant financial burden on the health care system. Moreover, is associated with a maternal morbidity rate of up to 3% Optimization of maternal comorbidities, appropriate antibiotic prophylaxis and evidence - based surgical newer techniques are some of the practices proven to be effective in reducing the incidence of SSI. Perioperative oxygen supplementation: Several RCTs evaluated the use of high (80%) perioperative oxygen supplementation: concentrations versus low (30%) on the incidence of SSI wound separation of the skin was significantly decreased from 7.4% to 1.6% in women whose incisions were closed with sutures compared with those closed with staples. Negative pressure wound therapy is the application of suction to healing wounds. The technique is used for the treatment of chronic wounds. Daily inspection of the cesarean incision is an essential part of the postoperative evaluation. The presence of fever, tenderness, erythema, purulent discharge, or induration should raise a suspicion of infection. Most wound infections do not become clinically apparent until postoperative days 4–7, when most women have already been discharged from the hospital. For that reason, it is essential to instruct these women on signs and symptoms requiring further evaluation since early treatment has an important role in preventing severe consequences.

Keywords: Cesarean section, management, surgical site infection.

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Introduction

Cesarean delivery stands as a pivotal obstetrical intervention aimed at safeguarding the lives of both mothers and fetuses. [1] However, this lifesaving procedure is not devoid of complications, with surgical site infection (SSI) emerging as a significant concern among them. The prevalence of SSI following cesarean deliveries varies globally, spanning from 3% to 15%. [2] Such disparities in incidence rates may stem from differences in population demographics, perioperative protocols, and the interval between the procedure and detection of infection. [3]

Over the past three decades, there has been a notable decline in the risk of SSI, attributed largely to advancements in hygiene practices, widespread utilization of antibiotic prophylaxis, adherence to sterile surgical techniques, and other preventive measures. [4] Despite these strides, a concerning

trend has emerged with the rise of virulent bacterial strains exhibiting resistance to multiple antimicrobial agents. Among these pathogens, *Staphylococcus aureus* looms as a particularly formidable adversary, capable of colonizing both skin and surgical wounds, thereby impeding the natural healing process. [5]

The repercussions of SSI extend beyond the confines of the operating room, exerting a profound impact on maternal well-being and healthcare infrastructure alike. [6] For mothers recuperating from cesarean deliveries, grappling with an SSI can prove immensely taxing, hindering their ability to care for newborns while navigating their own recovery journey. [7] Moreover, such infections often necessitate prolonged hospital stays, escalating healthcare expenditures, and engendering socio-economic ramifications that

reverberate throughout communities. [8] The primary aim of this study is to identify the risk factors associated with surgical site infections following cesarean section procedures. Additionally, we aim to assess the common pathogens implicated in these wound infections.

Material and Methods

An institution-based cross-sectional study with retrospective chart review was conducted at GG Hospital, Government Medical College Jamnagar, spanning from January 1, 2022, to December 31, 2023. The study protocol was approved by the institutional ethics committee. All patients who underwent cesarean section procedures during the study period were included, encompassing various types of cesarean sections, including emergency and elective procedures. Relevant data pertaining to patient demographics, obstetric history, perioperative variables, and postoperative outcomes were extracted from electronic medical records using a standardized data collection form. The presence of surgical site infection (SSI) following cesarean section was determined based on the disease classification and definition provided by the Centers for Disease Control and Prevention (CDC).

All types of cesarean sections were included in the study, while exclusion criteria comprised cases with pre-existing skin infections at the surgical site

or any complications related to suture or dressing materials. However, no patients meeting these exclusion criteria were identified during the study period.

The collected data were entered into EpiData version 3.1 and subsequently exported to Statistical Package for the Social Sciences (SPSS) software version 26 for analysis. Descriptive statistics were used to summarize the demographic and clinical characteristics of the study population. After checking for the presence of multicollinearity, factors with a univariate logistic regression analysis p-value of ≤ 0.2 were included in the multivariable logistic regression analysis. Variables with a p-value of <0.05 in the multivariable analysis were considered statistically significant and were retained in the final model.

Results

The study included 4333 patients, with 79% under 30 years old and 21% aged 30 or above. Among those under 30, 2.5% experienced SSI, while 3.3% of those aged 30 or above developed SSI. Rural residents comprised 68% of the population, with a slightly higher SSI prevalence (2.9%) compared to urban residents (2.4%). Among educated patients (76% of the total), 6.22% had SSI, while 13.88% of uneducated patients (24% of the total) experienced SSI.

Table 1: Socio-demographic characteristics

Variables	Category	Frequency		Percentage
		No.	SSI present	
Age	<30	3119	79	2.5%
	≥ 30	1214	41	3.3%
	Total	4333	120	
Residence	Urban	1365	34	2.4%
	Rural	2968	86	2.9%
	Total	4333	120	
Educational status	Educated	3294	68	6.22%
	Uneducated	1039	52	13.88%
	Total	4333	120	

In our study, among 4333 patients, 2.8% of primiparous women and 3.27% of those with previous cesarean sections experienced surgical site infection (SSI). The SSI prevalence was 2.6% among patients who attended antenatal care (ANC) visits, compared to 3.3% among those who did not. Labor duration less than 24 hours was associated with a 1.5% SSI prevalence, while labor lasting 24 hours or more had a prevalence of 3.01%.

Similarly, membrane rupture for less than 12 hours had a 1.5% SSI prevalence, while rupture for 12 hours or more had a prevalence of 3.01%. Anemia was present in 40% of cases, with a 3.0% SSI prevalence, compared to 2.6% among non-anemic patients. Chorioamnionitis was associated with a significantly higher SSI prevalence of 7.5%, compared to 2.7% among cases without chorioamnionitis.

Table 2: Obstetric related factors

Variables	Category	Frequency		Percentage
		No.	SSI present	
Parity	Primi-Para	3189	69	2.8%
	Previous CS	1144	39	3.27%
	Total	4333		
ANC visit	No	911	30	3.3%
	Yes	3422	90	2.6%
	Total	4333	120	
Duration of labour	<24hrs	3801	112	1.5%
	≥24hrs	532	08	3.01%
	Total	4333	120	
Duration of membrane rupture	Ruptured <12hrs	3801	112	1.5%
	Ruptured ≥12hrs	532	08	3.01%
	Total	4333	120	
Anaemia	Yes	1733	52	3.0%
	No	2600	68	2.6%
	Total	4333	120	
Present of chorioamnionitis	Yes	40	3	7.5%
	No	4293	117	2.7%
	Total	4333	120	17.68%

In our study, emergency cesarean sections were associated with a higher surgical site infection (SSI) prevalence of 18.38%, compared to 6.89% for elective cesarean sections. Obesity was linked to a higher SSI prevalence of 3.0%, while non-obese patients had a prevalence of 2.0%. Patients

receiving prophylactic antibiotics had a lower SSI prevalence of 2.71% compared to 3.2% among those who did not. Additionally, longer hospital stays (≥5 days) were associated with a slightly higher SSI prevalence of 2.3%, compared to 2.0% for stays less than 5 days.

Table 3: Operation related factors

Variables	Category	Frequency		Percentage
		No.	SSI present	
Type of CS	Emergency	593	109	18.38%
	Elective	29	2	6.89%
	Total	622	111	17.84%
Obesity	Yes	1386	42	3.0%
	No	2947	60	2.0%
	Total	4333	102	15.59%
Prophylactic antibiotics	Yes	4116	113	2.71%
	No	217	7	3.2%
	Total	4333	120	
Length of hospital stay	<5 days	3683	80	2.0%
	≥5 days	650	15	2.3%
	Total	4333	95	

Discussion

Our study, encompassing 4333 patients, delved into the demographic and socio-economic dynamics influencing surgical site infection (SSI) prevalence following cesarean section. Among our findings, we observed a higher incidence of SSI among older patients, with 3.3% of individuals aged 30 or above experiencing SSI compared to 2.5% among those under 30. Similarly, rural residents exhibited a slightly elevated SSI prevalence (2.9%) compared to urban counterparts (2.4%).

Comparatively, Krieger et al.'s⁹ study illustrates a decline in SSI rates over time, attributed to

healthcare advancements. Their findings highlight obesity, previous cesarean delivery, and hypertensive disorders as independent risk factors, aligning with broader literature on the subject. While our study did not identify obesity as a significant predictor, Krieger et al.'s [9] data underscore its association with higher SSI rates, emphasizing the multifactorial nature of SSI risk.

In contrast, De et al.'s [10] investigation provides insights into microbial etiology, with Gram-negative bacilli predominating SSI cases. They identify premature rupture of membranes, antibiotic timing, and prolonged hospital stays as significant

contributors to SSI risk. While our study did not delve into microbial profiles, these findings underscore the importance of considering patient-specific and procedural factors in SSI prevention. Gomma et al.'s² study further underscores the complexity of SSI risk assessment, identifying factors such as chorioamnionitis, emergency cesarean section, and gestational age as significant predictors. Their findings highlight the need for a comprehensive approach to SSI prevention, encompassing both patient-specific risk factors and procedural variables.

A study by He et al.'s [11] research adds valuable insights into the duration of hospitalization and factors associated with SSI. Their findings highlight the impact of provider experience, antenatal care irregularities, and postoperative complications on SSI occurrence. Conversely, Gupta et al.'s [12] study reveals a higher SSI rate of 10.3 per 100 surgeries, with inappropriate pre-surgical antibiotic prophylaxis, anemia, and previous cesarean sections as significant risk factors. Predominance of gram-negative isolates further complicates the SSI landscape. These studies collectively enrich our understanding of SSI risk factors, emphasizing the importance of tailored preventive strategies in mitigating post-cesarean infections.

Exploring the diverse facets influencing surgical site infection (SSI) rates following cesarean section, our study sheds light on critical determinants akin to those found in parallel investigations. The type of cesarean section (CS), distinguishing between emergency and elective procedures, surfaced as a pivotal factor impacting SSI prevalence, as observed in studies by Krieger et al. [9] and He et al. [11]. Additionally, the presence of obesity among cesarean delivery patients, as highlighted in Gupta et al.'s [12] study, underscored its significant role in SSI risk assessment.

Furthermore, the administration of prophylactic antibiotics emerged as a vital consideration across studies, including ours and those by He et al. [11] and Gupta et al. [12], with implications for postoperative infection rates. Similarly, the duration of hospital stay post-cesarean section surgery, as observed in He et al.'s [11] study, reflected the importance of this variable in understanding SSI prevalence. Moreover, the duration of labor and membrane rupture, as found in our study and echoed in He et al.'s [11] research, emerged as critical determinants of SSI risk profiles among patients. Anemia, a common comorbidity among pregnant women, was identified as a significant factor in SSI risk assessment in our study and Gupta et al.'s [12] investigation. Lastly, the presence of chorioamnionitis, as highlighted in De et al.'s [10]

study, significantly impacted SSI rates, reinforcing the importance of prompt intervention and vigilant monitoring in such cases.

While our study provides valuable insights into the risk factors for surgical site infection (SSI) following cesarean section, several limitations warrant consideration. Firstly, our study's retrospective design may introduce bias and limit the ability to establish causality between identified factors and SSI occurrence. Additionally, the reliance on medical records for data collection may lead to incomplete or inaccurate information, potentially impacting the validity of our findings. Furthermore, our study was conducted at a single tertiary care center, limiting the generalizability of our results to broader populations with different healthcare settings and demographics. Moreover, the absence of microbial analysis in our study prevents a comprehensive understanding of the specific pathogens contributing to SSI post-cesarean section.

Conclusion

In conclusion, the discussion of our study's results alongside comparable findings from existing literature elucidates the complex interplay of obstetric-related factors in shaping surgical site infection (SSI) prevalence following cesarean section. Our study, encompassing a substantial cohort of patients, highlights key determinants such as parity, antenatal care attendance, labor duration, membrane rupture, anemia, and chorioamnionitis as significant contributors to SSI risk profiles. These findings align with and complement observations from parallel investigations, further substantiating the importance of these factors in SSI development post-cesarean section.

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