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Original Research Article

## Study of surgical site infection in patients undergoing caesarean section at tertiary care center, Gujarat

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### ABSTRACT

**Background:** Surgical site infection following cesarean delivery leads to increasing the duration of patient hospitalization, hospital costs and raise the burden on our healthcare system. The incidence of SSI after cesarean range from 3% to 5%. Objective of current investigation was to study the risk factor & microbial agents responsible for SSI in LSCS and impact of SSI on perinatal outcome.

**Methods:** This prospective study was done among 324 pregnant women undergoing LSCS at department of obstetrics and Gynecology in GMERS medical college & hospital, Sola, Ahmedabad during April 2015 to April 2016. All patients were following up to 7<sup>th</sup> postoperative day. SSI was defined by CDC criteria.

**Results:** The incidence of SSI noted in present study was 8.02%. Almost 46.2% cases had BMI  $\geq 25$  kg/m<sup>2</sup>, 65.4% multipara, 34.6% resided in rural area of SSI group. PIH, PROM, LSCS in emergency, multiple vaginal examination (>3), perioperative blood glucose ( $\geq 110$  mg/dl), duration of surgery ( $\geq 60$  min), past H/O of LSCS noted in participants of SSI was 30.8%, 30.8%, 96.1, 19.3%, 84.6%, 23.1%, 73.1% respectively. *Staphylococcus aureus* was the most common microorganism identified and incidence of NICU admission was 11.5% in SSI group.

**Conclusions:** Incidence of SSI in present is 8.02%. BMI, PIH, PROM, LSCS in emergency, multiple vaginal examination (>3), perioperative blood glucose ( $\geq 110$  mg/dl), duration of surgery ( $\geq 60$  min), Past H/O of LSCS were noted statistically significantly higher among the participants of SSI group. *Staphylococcus aureus* was the most common organism identified.

**Keywords:** Cesarean delivery, Incidence of SSI, Microorganism, Risk factor, Surgical site infection

### INTRODUCTION

A caesarean section (CS) is an operation in which surgery was made through a mother's abdominal wall and underlying tissues to dislodge the baby.<sup>1</sup> Out of all major abdominal operation, CS is the most common procedure done among women in both developed and developing nations.<sup>2</sup> Adverse event like infection, postpartum hemorrhage, bladder injury and increased risks during future pregnancies also noted after CS.<sup>3</sup> Surgical site infection (SSI) following caesarean delivery leads to increasing the duration of patient hospitalization, hospital costs and raise the burden on our healthcare system.<sup>4</sup> The

incidence of SSI after caesarean ranges from 3% to 5%.<sup>5</sup> The incidence rate of SSI following CS associated with many factors like wound class, maternal age, hypertensive disorders, types of CS procedures, number of vaginal examinations, high volume of blood loss during surgery, diabetes, maternal weight, surgical techniques and premature rupture of membrane.<sup>6-11</sup> Incidence of episodes of fever, endometritis, wound infection; urinary tract infection and serious infection after caesarean section can be reduce by use of prophylactic antibiotics in women undergoing caesarean section.<sup>12</sup> So, present study was conducted with the objectives to study the risk factor and microbial agents

responsible for SSI in LSCS and impact of SSI on perinatal outcome.

**METHODS**

This prospective study was done among 324 pregnant women undergoing LSCS at department of obstetrics & gynecology in GMERS medical college & hospital, Sola, Ahmedabad during April 2015 to April 2016. Data collection was done after ethical permission from institutional ethical committee and informed consent of clients. Pre-tested questionnaire was administered and details like socio-demographic information, past history of medical illness, menstrual history, obstetrical history, history of previous operation, medical illness was collected. Postoperatively women were monitored for signs of infection. Surgical wound was inspected at the time of first sign of SSI and daily thereafter, till the discharge of patient. All patients were following up to 7<sup>th</sup> postoperative day. Those who do not develop SSI suture removal was done on 7<sup>th</sup> post-operative day. SSI was defined by CDC criteria. Information about the SSI would include the date of SSI, specific criteria met for identifying the SSI, when/how the SSI is detected, whether the patient develops a secondary bloodstream infection, and the organisms isolated from cultures and the organisms’ antimicrobial susceptibilities. Out of 324 pregnant women, 26 patients had developed wound site infection as per CDC criteria and 298 had not. The data were recorded in an Excel sheet and descriptive analysis was performed, of which data are presented in the tables. To know the association between dependent and independent variables chi-square was applied accordingly, p value less than 0.05 was considered as statistically significant.

**RESULTS**

Total 3.8% participants of group SSI and 3.4% of group ‘without SSI’ were ≥35 years age respectively (p>0.05) and mean age was 27.3 years and 25.6 years of the participants of SSI and ‘without SSI’ group respectively (p>0.05) (Table 1). Almost 34.6% participants of group SSI and 7% of group ‘without SSI’ came from rural area respectively (p<0.05). Almost 69.5% participants of group SSI and 67.1% of group ‘without SSI’ belonged to lower socio-economic class respectively (p<0.05). Almost 46.2% participants of group SSI and 23.8% of group ‘without SSI’ noted with BMI ≥25 kg/m<sup>2</sup> respectively (p<0.05). Almost 65.4% participants of group SSI and 63.1% of group ‘without SSI’ noted with multiparity respectively (p<0.05). Almost 53.8% participants of group SSI and 42% of group ‘without SSI’ noted with GA ≤37 weeks respectively (p>0.05).

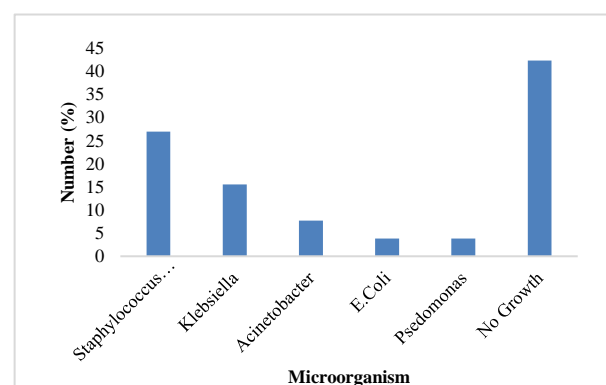
Risk factor like PIH, PROM, LSCS in emergency, multiple vaginal examination (>3), postoperative hemoglobin (<11 gm/dl), perioperative blood glucose (≥110 mg/dl), fat thickness (<2 cm), duration of surgery (≥60 min), past H/O of LSCS noted in participants of SSI

& ‘without SSI’ group was 30.8% vs. 8.7% (p<0.05), 30.8% vs. 8% (p<0.05), 96.1% vs. 74.5% (p<0.05), 19.3% vs. 6.1% (p<0.05), 92.3% vs. 83.8% (p>0.05), 84.6% vs. 47% (p<0.05), 30.8% vs. 19.8% (p>0.05), 23.1% vs. 7% (p<0.05), 73.1% vs. 52% (p<0.05) respectively (Table 2).

**Table 1: Distribution of socio-clinico characteristics of study participants (n=324).**

Parameters	Groups		P value
	SSI (N=26) Frequency (%)	Without SSI (N=298) Frequency (%)	
<b>Age (year)</b>			
<35	25 (96.2)	288 (96.6)	0.89
≥35	1 (3.8)	10 (3.4)	
Mean age	27.3	25.6	0.12
<b>Residence</b>			
Rural	9 (34.6)	21 (7)	0.001
Urban	17 (65.4)	277 (93)	
<b>Socioeconomic class</b>			
Higher	0 (0.0)	3 (1.0)	0.87
Middle	8 (30.5)	95 (31.9)	
Lower	18 (69.5)	200 (67.1)	
<b>BMI (kg/m<sup>2</sup>)</b>			
<25	14 (53.8)	227 (76.2)	0.01
≥25	12 (46.2)	71 (23.8)	
<b>Parity</b>			
Primi	9 (34.6)	110 (36.9)	0.05
Multi	17 (65.4)	188 (63.1)	
<b>Gestational age (weeks)</b>			
≤37	14 (53.8)	125 (42.0)	0.23
>37	12 (46.2)	173 (58.0)	

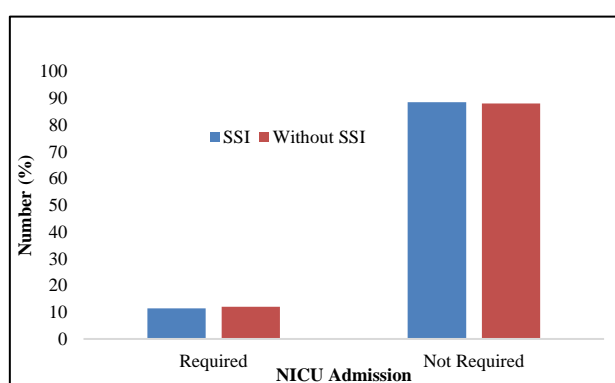
Microorganism like *Staphylococcus aureus*, *Klebsiella*, *Acinetobacter*, *E. coli*, *Pseudomonas*, showed no growth isolated from the surgical site of SSI among the 26.9%, 15.5%, 7.7%, 3.8%, 3.8%, 42.3% participants of SSI group respectively (Figure 1). NICU admission required in 11.5% participants of SSI group and 12% of ‘without SSI’ group (p>0.05) as depicted in (Figure 2).



**Figure 1: Microorganism isolated from surgical site among the participants of SSI group (n=26).**

**Table 2: Distribution of risk factor for SSI in LSCS among study participants (n=324).**

Parameters	Groups		P value
	SSI (N=26) frequency (%)	Without SSI (N=298) frequency (%)	
PIH	8 (30.8)	26 (8.7)	0.001
PROM	8 (30.8)	24 (8.0)	0.0001
LSCS in emergency	25 (96.1)	222 (74.5)	0.02
Multiple vaginal examination (>3)	5 (19.3)	18 (6.1)	0.01
Postoperative hemoglobin (<11 gm/dl)	24 (92.3)	250 (83.8)	0.42
Perioperative blood glucose (≥110 mg/dl), mean (mg/dl)	22 (84.6), 118	140 (47.0), 101	0.001, 0.02
Fat thickness (<2 cm)	8 (30.8)	59 (19.8)	0.18
Duration of surgery (≥60 min)	6 (23.1)	21 (7.0)	0.004
Past H/O of LSCS	19 (73.1)	155 (52.0)	0.03



**Figure 2: NICU admission required among the participants (n=324).**

## DISCUSSION

The study was conducted for analysis of surgical site infection in caesarean section of 324 patients, so the incidence of SSI noted in present study was 8.02%. Present study noted statistically not significantly almost similar age distribution among participants of both the groups. Present study registered statistically significantly 5 times higher number of rural participants in SSI group compare to ‘without SSI’ group. Present study noted statistically not significantly almost similar S-E status distribution among participants of both the groups.

Present study observed that BMI ≥25 kg/m<sup>2</sup> noted statistically significantly among almost double number of participants of SSI group compare to ‘without SSI’ group. This finding is correlate with the study done by De D et al.<sup>16</sup> Present study noted statistically significantly almost similar parity distribution among participants of both the groups. In present study, wound infections were more in multiparous women. Out of 26 patients 17 are multiparous women. Similar result was found in Bhadauria et al and Rehman et al in their studies, they observed that SSI was more in case of multiparous women. They said malnutrition and anemia due to

repeated child birth could be the predisposing factors for SSI occurrence in multiparous women.<sup>17-19</sup>

**Table 3: Comparison of ‘incidence of SSI’ of present study with other similar study.**

Study	Incidence of SSI (%)
Wloch et al <sup>13</sup>	9.6
Gupta et al <sup>14</sup>	10.3
Gelaw et al <sup>15</sup>	6.8
De et al <sup>16</sup>	24.2
Filbert et al <sup>17</sup>	10.9
Al Jama et al <sup>5</sup>	4.2
Present study	8.02

Present study found that risk factor like PIH, PROM, LSCS in emergency, multiple vaginal examination (>3), perioperative blood glucose (≥110 mg/dl), duration of surgery (≥60 min), past H/O of LSCS were noted statistically significantly higher among the participants of SSI group compare to ‘without SSI’ group. Risk factor like postoperative hemoglobin (<11 gm/dl) and fat thickness (<2 cm) also noted higher among the participants of SSI group compare to ‘without SSI’ group but it was statistically not significant. These finding is correlate with the study done by Dessu et al, Amenu et al, Bizimana et al, Chu et al, Karl et al, Callaghan et al.<sup>20-25</sup> Present study also sent all the sample from each case of SSI group for microorganism identification and it was found *Staphylococcus aureus* was the most common organism identified. This finding is correlate with the study done by De et al, Al Jama et al and Dhar et al.<sup>16,5,26</sup> Study done by Mhaske et al found MRSA (37.5%) was the commonest pathogen to produce SSI in our series, followed by sterile culture in 21% cases.<sup>27</sup> Bhavani et al found that most common pathogens were *S. aureus*, *Pseudomonas aeruginosa* and *E. coli*, as was also observed in their study.<sup>28</sup> Present study observed that incidence of NICU admission was almost similar among both the groups but it was statistically not significant.

## CONCLUSION

The present study highlights on the incidence of wound infection, possible risk factors for SSI and etiology of wound infection. Incidence of SSI in present is 8.02%. It was evident from the present study that random blood glucose level  $\geq 110$  mg/dl has more chance of SSI. It was concluded that BMI  $\geq 25$  kg/m<sup>2</sup> is associated with development of SSI. It was concluded that patients from rural area, presence of PIH, presence of PROM, multiple vaginal examination is associated with development of SSI. It was evident from present study that patients having emergency LSCS and duration of surgery  $\geq 60$  minutes have had more chance of SSI. Patients having emergency LSCS and having any risk factor mention above have had increased chances of SSI. We isolated *Staphylococcus aureus* as a most common microorganism causing wound infection. *Staphylococcus aureus* is 71.4% sensitive to prophylactic antibiotics. In present study perinatal outcome was not affected in patients with SSI.

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