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Research Article *Open Access*

A STUDY OF SURGICAL SITE INFECTIONS -POST CESAREAN SECTION AT A TERTIARY CARE CENTRE IN NORTH INDIA

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Abstract

Surgical Site Infections (SSIs) develop at the surgical site within 30 days of surgery, or within 90 days if prosthetic materials were used. Cesarean Section (CS), is one of the most common obstetric procedure performed, and also associated with an increasing rate of SSI, leading to longer hospital stays, higher costs, and additional burdens for mothers. With SSI rates varying from 3% to 20%, this study aimed to report the incidence of SSI, analyze the risk factors, identify the causative microorganisms, and assess antibiotic susceptibility and resistance pattern. The aim of the study is to determine the incidence of SSI post cesarean section , to identify the risk factors associated with SSI and also to identify the type of microorganisms present and to analyze their antibiotic susceptibility and resistance patterns.

Keywords: Antibiotics, Cesarean Section, Incidence, Pathogens, Risk Factors, Surgical Site Infections.

INTRODUCTION

Cesarean Section (CS) is a obstetric surgical procedure by which a fetus is delivered through incisions made in the abdominal and uterine walls and commonly performed major obstetrical surgeries worldwide[1]. When properly indicated, it can prevent poor obstetric and perinatal outcomes and it can be a life-saving procedure for both the fetus and the mother. Over the past decade, the CS rate has progressed globally. The major complications associated with CS include haemorrhage, postpartum endometritis, wound-related complications (e.g., surgical site infections), thromboembolic disorders, and anaesthesia-related complications. The most common postoperative complication following CS is surgical site infection (SSI)[2]. The incidence of SSI ranges from 3% to 20% globally [3]and it is one of the important causes for the increased rate of maternal mortality and morbidity.To reduce the incidence of SSI, the following practices should be recommended in daily practices such as proper management of maternal co-morbidities, appropriate usage of antibiotic prophylaxis before surgery, and appropriate surgical techniques.

MATERIALS AND METHODS

A case-control study was conducted in the Department of Obstetrics and Gynaecology over 18 months (August 2022 to February 2024) involving 80 participants (40 cases and 40 controls).All female who had LSCS at our institution and who had fulfilled the participant's inclusion and exclusion criteria were considered for enrollment in this study after informed consent

Inclusion criteria:
-Patients who had a cesarean section in our hospital
-Patients who develop SSI after cesarean section as per CDC criteria.

Exclusion criteria:
-Patients whose surgery was done in other healthcare facilities.
-Patients who had undergone hysterectomy during cesarean delivery
-Patients who were not willing to take part in the study
Patients were followed up on the 3rd, 10th, and 30th postoperative day to watch for signs of SSI such as fever, erythema, pain, pus discharge from suture site and wound gaping. Wound swabs from discharge sites were sent for microbiological analysis, and data of SSI cases were recorded. If follow-up is lost with the patient on POD 30, they were contacted telephonically and asked regarding the presence or signs of SSI. If present they were called to OPD for follow up.

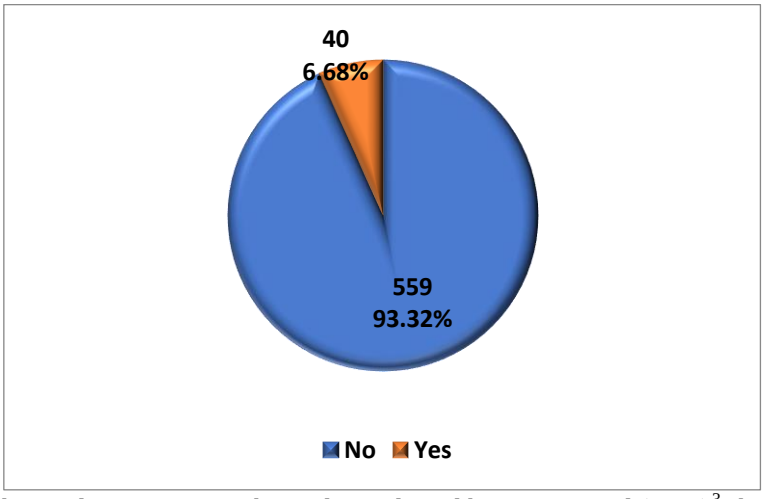
Cases- All women who developed characteristic features of SSI following LSCS and fulfilling CDC criteria were considered as case group.

Control groups were selected as per inclusion criteria 1: 1. Women who had underwent LSCS on the same day or 1 day before or after the day of surgery of SSI case group and who do not develop SSI up to 30th postoperative day and who come for a regular follow up were considered as the controls.

RESULTS AND DISCUSSION

The study was carried out in the Department of Obstetrics & Gynaecology, Christian Medical College & Hospital, Ludhiana, Punjab. During the study period from 15th August 2022 to 14th February 2024, a total of 599 LSCS were performed, out of which 40 patients (6.68%) developed SSI after CS and were included as cases and 559 women (93.32%) who did not develop signs of SSI were taken as controls. The risk factors responsible for SSI in LSCS patients were assessed and the results were as follows**.**

Incidence of SSI in LSCS deliveries:



The incidence of SSI in this study was 6.68%. The study conducted by Gomaa et al (2021)[3] showed an incidence of 5.34 % which is similar to our study.In a study by Pathak et al (2017)[11] the incidence of SSI was 7.84%. A similar study of SSI by Mpogoro et al (2014)[8] showed that the incidence rate was 10.9 % which is higher when compared to our study.

Distribution according to the number of Pelvic examinations in cases and controls:

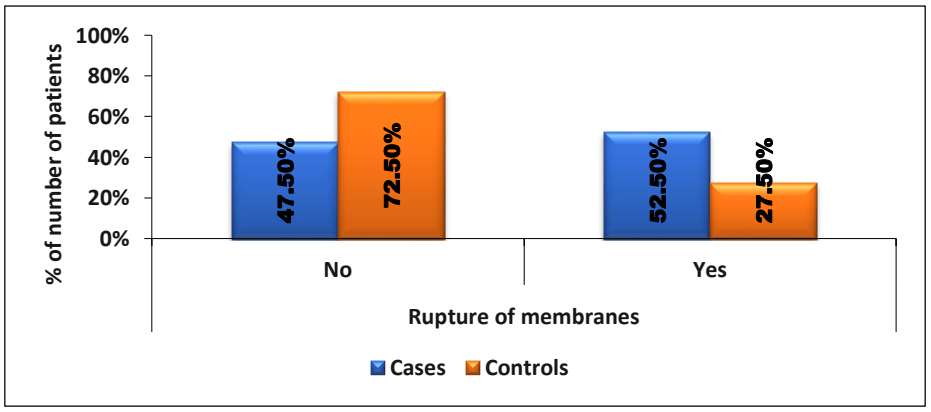
Number of Pelvic examinations	Cases (n=40)	Controls (n=40)	Total	P value
None	8 (20%)	19 (47.50%)	27 (33.75%)	<.0001†
1 to 4	9 (22.50%)	18 (45%)	27 (33.75%)	

>4	23 (57.50%)	3 (7.50%)	26 (32.50%)	
Total	40 (100%)	40 (100%)	80 (100%)	

† **Chi-square test**

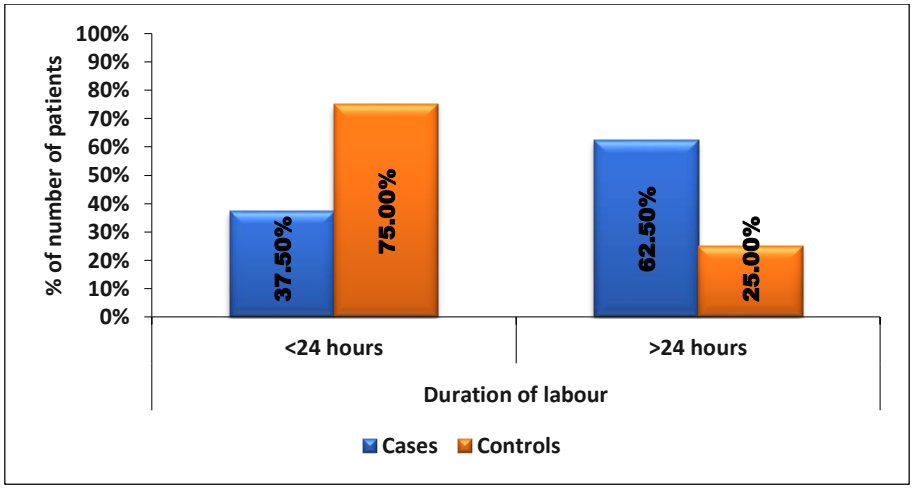
In case group, 23 women (57.50%) had more than 4 pelvic examinations, 9 (22.5%) had 1-4 Pelvic examinations only 8 (20%) had no pelvic examinations done.In the control group 19 (47.5%) had no pelvic examination,18 (45%) had 1-4 pelvic and 3 (7.5%) had > 4 pelvic examinations. The distribution of patients depending on the number of pelvic examinations revealed significant differences in both cases and controls. This disparity in the number of pelvic examinations was statistically significant (p-value < 0.0001).

Distribution according to rupture of membranes in cases and controls:



In the present study among the case group,21 women (52.5%) had rupture of membranes before labour whereas in the control group, 29 women (72.5%) did not have rupture of membranes. The distribution of patients with rupture of membranes was significantly higher among cases when compared to controls.This difference in rupture of membranes was statistically significant (p value=0.022).

Distribution according to the duration of labour in cases and controls:



In the case group, 25 antenatal women (62.5 %) experienced labour duration > 24 hours, and 15 women (37.5%) had duration of labour< 24 hours. Among the control group, 30 women (75%) had <24 hours, and 10 women (25%) > 24 hours. There is a disparity in labour duration among cases and controls and the distribution was statistically significant (p value=0.0007).

Distribution according to duration of surgery in cases and controls.

Duration of surgery	Cases (n=40)	Controls (n=40)	Total	P value
<1 hour	9 (22.50%)	29 (72.50%)	38 (47.50%)	<.0001†
>1 hour	31 (77.50%)	11 (27.50%)	42 (52.50%)	
Total	40 (100%)	40 (100%)	80 (100%)	

† **Chi-square test**

In cases, the surgery duration more than 1 hour was seen in 31 patients (77.5%) patients (maximum duration was 2 hours) and less than 1 hour in 9 women (22.5%).

72.5% of controls had their surgery duration < 1 hour and 11 patients (27.5%) had >1 hour. The percentage of female who had surgery for >1 hour was significantly higher in cases than controls. Conversely, the proportion of women whose surgery lasted for <1 hour was significantly lower in cases compared to controls.This difference in the duration of surgery was statistically significant (p-value < 0.0001).

The rate of SSI almost doubles with each hour of surgery ,due to increased duration of exposure to microorganisms in the OT.

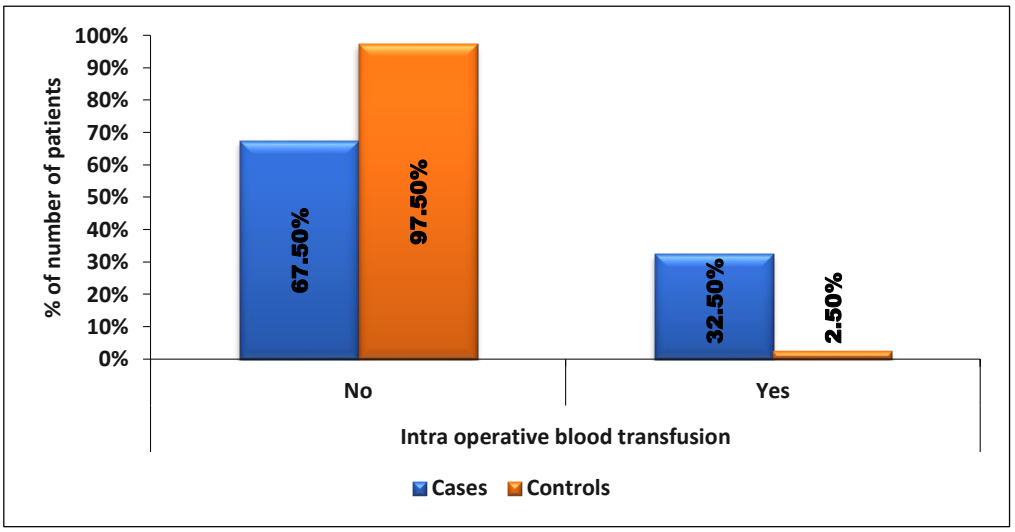
Distribution according to intra-operative blood loss in cases and controls:

Intra-operative blood loss	Cases (n=40)	Controls (n=40)	Total	P value
<1000 ml	29 (72.50%)	39 (97.50%)	68 (85%)	0.003*
>1000 ml	11 (27.50%)	1 (2.50%)	12 (15%)	
Total	40 (100%)	40 (100%)	80 (100%)	

* **Fisher's exact test**

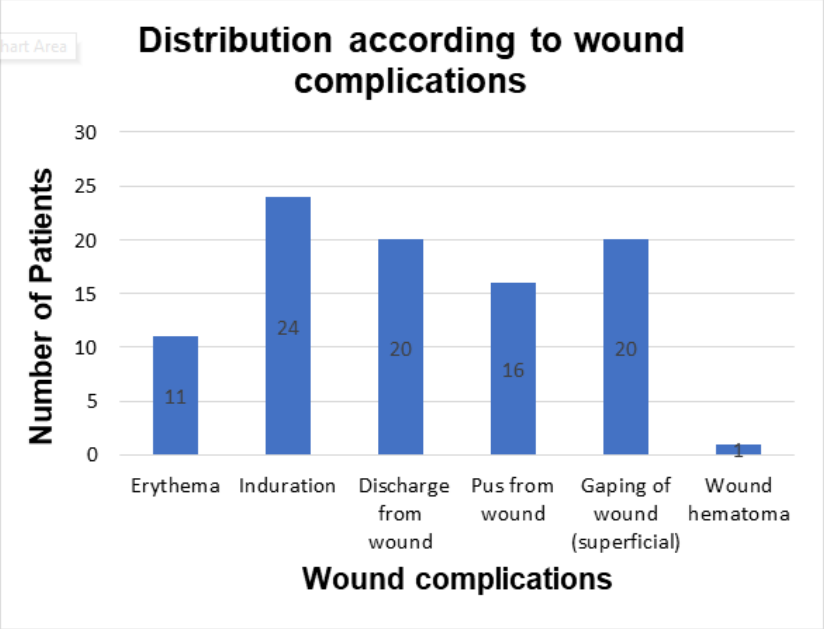
Among the case group, the proportion of patients who had intraoperative blood loss exceeding 1000 ml was 11 (27.5%) which was lower than those who had intraoperative blood loss less than 1000 ml in 29 women (72.5%).In the control group, 39 (97.5%) had intraoperative blood loss <1000 ml. The distribution according to intraoperative blood loss was statistically significant (p value=0.003).

Distribution according to intra-operative blood transfusion in cases and controls:



In the case group, 27 women (67.5%) had an intraoperative blood transfusion with 1 PRBC (3 women received 2 PRBC) and 13 women (32.5%) had no transfusion. Intraoperative blood transfusion was not given in 97.5% of controls, which was more than the case group. This difference in intraoperative blood transfusion in cases and controls was statistically significant (p value=0.0007).

Distribution according to wound complications:



*Some patients had more than 1 wound complication

Induration was reported in 24 cases (60.00%), gaping of wounds in 20 cases (50.00%), pus discharge from wounds in 16 patients (40.00%), erythema in 11(27.50%), discharge from the wound which were of serosanguinous, serous, blood-stained and greenish discharge present in about 20 cases (50%), and wound hematoma in 1 case (2.50%).

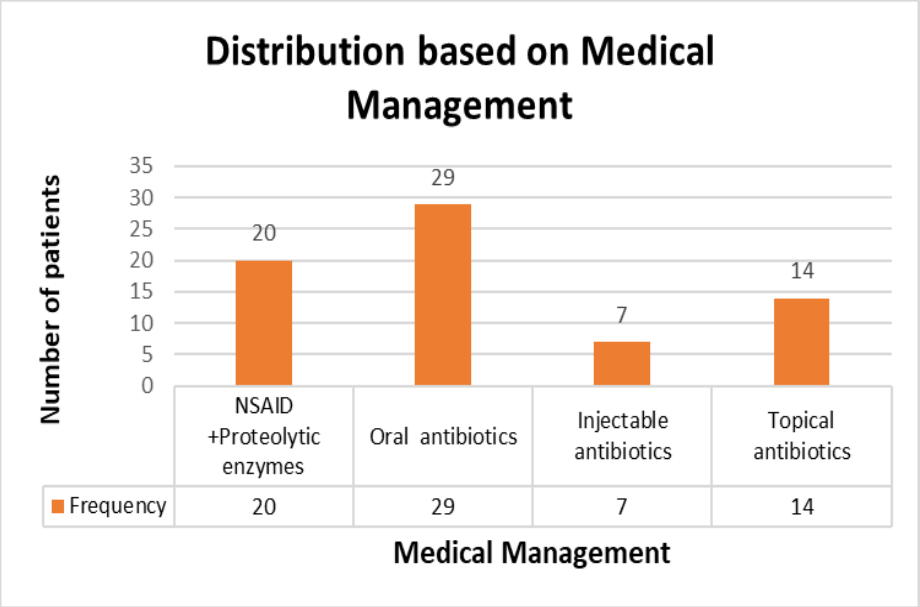
Distribution according to the type of organisms on wound culture:

Organisms	Frequency	Percentage

Sterile	31	77.50%
Coagulase Negative Staphylococcus (CONS)	2	5.00%
Methicillin-resistant Staphylococcus aureus (MRSA)	2	5.00%
Escherichia coli	1	2.50%
Enterococcus species	1	2.50%
Pseudomonas aeruginosa	1	2.50%
*Pseudomonas aeruginosa+Klebsiellapneumoniae	1	2.50%
*Pseudomonas aeruginosa+Escherichia coli	1	2.50%

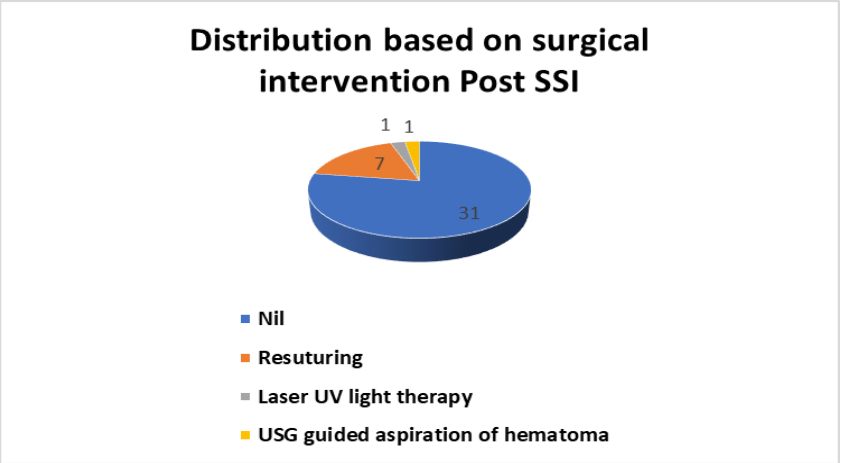
*2 cases had more than 1 organisms isolated in the wound culture.
The above table shows the presence of organisms found in wound culture taken from the surgical site. In the case group, 31 cases (77.50%) had sterile culture reports observed after 48 hours.
In the 22.5 % isolates with growth, Pseudomonas aeruginosa was isolated in 3 cases (7.50%). In 1 case along with Pseudomonas aeruginosa, Klebsiella pneumoniae was also isolated. In another case along with Pseudomonas aeruginosa, Escherichia coli was isolated. CONS (Coagulase Negative Staphylococcus) was isolated in 2 cases (5.00%), Methicillin-Resistant Staphylococcus Aureus (MRSA) in 2 cases (5%), Escherichia coli in 2 cases (2.50%) and Enterococcus species were isolated in 1 case (2.50%).

Distribution based on medical management:



Medical management among cases varied as follows: 20 cases (50%) were treated with NSAID +Proteolytic enzymes, oral antibiotic (Amoxicillin + Potassium clavulanate, Ofloxacin + Ornidazole, Clindamycin, Cefuroxime) prescribed to 29 cases (72.50%), topical antibiotics in 14 cases (35%) and injectable antibiotics Piperacillin +Tazobactam, Tinidazole, Imipenem, Colistin) were administered in 7 cases (17.5%).

Distribution based on surgical intervention Post SSI:



The above table depicts the surgical interventions among cases: 31 cases (77.50%) required no surgical intervention, 7 patients (17.50%) had undergone resuturing, and 1 woman (2.50%) underwent laser UV light therapy and 1 patient (2.50%) had USG-guided aspiration of hematoma

Risk factors for SSI:
This study found that risk factors like anaemia, diabetes, and previous LSCS each contributes to 12.5%, gestational hypertension, thrombocytopenia, cholestasis of pregnancy, antepartum haemorrhage each contributes to 10 %, obesity (7.5%) and hypothyroidism (2.5%) highly contribute to SSI when compared to controls.

ABBREVIATIONS

SSI	-Surgical Site Infection
LSCS	-Lower Segment Cesarean Section
CS	-Cesarean Section
CDC	-Centre for Disease Control and Prevention
PROM	-Premature Rupture of Membranes
E. coli	-Escherichia Coli
CONS	-Coagulase Negative Staphylococci
S.aureus	-Staphylococcus Aureus
MRSA	-Methicillin Resistant Staphylococcus Aureus
MR-CONS	-Methicillin Resistant Coagulase Negative Staphylococci
ESBL	-Extended Spectrum Beta Lactamase
OPD	-Out Patient Department
POD	-Post Operative Day
PV	-Per vaginal examination
GDM	-Gestational Diabetes Mellitus
APH	-Antepartum Haemorrhage
OT	-Operation Theatre
PRBC	-Packed Red Blood Cells

CONCLUSION

The incidence of SSI in our study was 6.68%, indicating that a notable proportion of female undergoing CS are affected by this complication.
Strategies for prevention of SSIs should aim to correct pre-existing anaemia before surgery, optimal blood glucose control in diabetics pre-operatively, prophylactic antibiotics, strictly adhere to aseptic techniques during surgery and wound care, avoid unnecessary pelvic examinations to decrease the risk of introducing pathogens, efforts to minimize the timing of surgery, ensure appropriate and timely administration of antibiotics based on microbial susceptibility and resistant pattern ,proper patient education on signs of infection and wound care.

DISCLOSURE

The author declares that there is no conflict of interest regarding the publication of this paper.

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