International Journal of Science and Research (IJSR)
ISSN: 2319-7064
SJIF (2022): 7.942

Microbiology and Risk Factors Associated with Surgical Site Infection among LSCS Patients

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Abstract: ***Background: Surgery duration of more than 1 hour is reported to increase the risk for SSI more than two-fold. Readmission of postpartum women owing to SSI in the hospital not only places additional strain on healthcare facilities and employees, but it also has a significant negative influence on a mother's emotional health. Objective: The aim of this study is to identify the common pathogen and risk factors associated with surgical site infection among LSCS patients. Methodology: Total 160 patients undergoing LCSC were included. Controls (n=80) are the patients without SSI and cases (n=80) are the patients having an SSI within 30 days of LSCS. Results: Total 21.25% patients had sterile culture whereas in rest of patients, the most common pathogen identified was streptococci followed by gram positive and acinetobacter. Most common type of discharge was purulent type followed by serous and seropurulent type of discharge. Total 66.3% patient of SSI was recovered with dressing and proper antibiotic coverage. Total 21.25% patients were admitted to ICU/HDU in both groups. Mean days for hospital stay was significantly higher for controls compared to cases. Conclusion: Post caesarean surgical site infection is the one of the common causes of maternal morbidity and mortality. A proper assessment of risk factor that predispose to SSI and their modification may help in reduction of SSI rates.***

Keywords: Pathogen, Microbiology, Gynecology, Cesarean, Infection

1. Introduction

In order to preserve the lives of pregnant women and their unborn children, caesarean deliveries are the most prevalent obstetrical surgical treatment worldwide. Its global rates range from 5 to 20% and this includes both emergency and elective procedure and the rates are rising in both developed and developing countries (1-3) . According to a WHO declaration from 1985, a country's optimal caesarean section (C-section) rate should be between 5-20 percent (4) . According to India's National Family Health Survey (NFHS 4), C-section deliveries accounted for 17% of live births.45 percent of C-section births, or emergency C-sections, were scheduled after the commencement of labour pains. According to statistics from NFHS 4, the prevalence of C-sections in India increased from 8.5 percent to 17.2 percent. This is an increase of 9% over ten years (5).

According to the Centers for Disease Control and Prevention (CDC), SSI is an infection that develops within a month of any surgical treatment. Three types of SSI include Organ/space SSIs, deep incisional SSIs, and superficial incisional SSIs. Incisional SSI is further separated into two types: deep SSI, which affects fascial and muscle layers, and superficial SSI, which affects the skin and subcutaneous tissue. In comparison to vaginal deliveries, the maternal infectious morbidity during caesarean delivery increases eight-fold. Readmission is a typical issue since surgical site infection might appear before or after the patient leaves the hospital (6, 7) . The recent incidence rates of SSI following cesarean section in India is 13% And it seems a frequent complication of C-section (8).

Improvements in hygienic conditions, antibiotic prophylaxis, sterile processes, and other measures can reduce the incidence of SSI. The mother's struggle to recuperate from the operation while simultaneously caring for the infant during SSI is frustrating. Additionally, it prolongs maternal hospital stays, raises health care expenses, has significant socioeconomic repercussions, and affects the mother psychologically (9-11).

There are a number of risk factors for SSI following a C-section. Preoperative complications such high parity, premature rupture of the membranes (PROM), chorioamnionitis, hypertension, Diabetes Mellitus (DM), obesity, extended labour, PROM, chorioamnionitis, emergency C-section, and absence of antenatal care (ANC) visits. Some intraoperative circumstances, such as prolonged operation time, vertical skin incision, and interrupted skin suturing, are strongly linked to the development of SSI. Blood loss is also a risk factor for SSI post operatively. Postoperative anemia is also a risk factor for SSI (12).

Surgery duration of more than 1 hour is reported to increase the risk for SSI more than two-fold. Readmission of postpartum women owing to SSI in the hospital not only places additional strain on healthcare facilities and employees, but it also has a significant negative influence on a mother's emotional health. Consequently, recognizing SSI risk factors in a hospital context can aid in lowering maternal morbidity and death. The aim of our study is to determine the risk factors associated with surgical site infection among LSCS patients at umaid hospital and to identify the common pathogen responsible for surgical site infection after LSCS.

2. Methodology

Study Design: Present study was a prospective, observational, case control and hospital-based study in which 160 patients who underwent caesarean delivery and admitted in post-natal ward and attending post-natal clinic were included. Total patients were divided into two groups: Control group included the 80 patients of LSCS who do not developed any SSI within the 30 days of delivery whereas Case group included the 80 patients of LSCS who developed SSI within the 30 days of delivery.

Specimen Collection and processing: Two **s**wab samples were taken from the site of surgical infection. One swab was utilised for culture-sensitivity testing and another was used for direct microscopy. Before applying a dressing to the

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wound, the swabs were taken by a competent healthcare professional under sterile conditions. All of the acquired swabs were levelled and promptly brought with a completed sample requisition form to the microbiological laboratory.

Microorganism identification: On blood and agar media, all of the received swab samples were cultivated. For the purpose of detecting fastidious organisms, the infected culture plates were incubated at 37°C for 18 to 24 hours, with a 48-hour maximum incubation period. The three main methods used to identify bacterial isolates were Gram's staining, colony morphology, and common biochemical testing. Final confirmation and microbiological identification were carried out in accordance with customary CLSI procedures.

Statistical analysis: Data was collected and entered in Excel sheet. SPSS 27.0 software was used to analyze data. Data was presented as mean and SD or number and percentage. Unpaired t-test or chi-square test was used to compare two groups by taking p value <0.05 as significant.

3. Results

The mean age of control group was 26 ± 4.74 years and in case group was 26.84 ± 5.76 years. Patient with low education level is more in both group 62% and 69% in control and case group respectively. Most C-section is done at term gestational age. Overall, 57.5% patients are with parity more than one (Table 1).

Table 1: Sociodemographic and clinical determinant of patients

Variable	Subdomain	Control	Case	P Value
Mean age		26 ± 4.74 years	26.84 ± 5.76 years	0.317
Education	Literate	28 (38%)	25 (31%)	0.614
	Ill literate	52 (62%)	55 (69%)	
Residence	Rural	17 (21.25%)	48 (65%)	0.000*
	Urban	63 (78.75%)	32 (95%)	
Gestation	Term	75 (93.8%)	72 (90%)	0.385
	Preterm	5 (6.3%)	8 (10%)	
Gravidity	Multi	46 (57.5%)	46 (57.5%)	1.000
	Primi	34 (42.5%)	34 (42.5%)	

The most common type of discharge was purulent type in SSI patient that is 48 (60%) patients, followed by serous (23.8%%) and seropurulent type of discharge (16.3%). Total 53 (66.3%) patient of SSI was recovered with dressing and proper antibiotic coverage. Only 27 (33.8%) patients required resuturing (Table 2).

Table 2: Type of discharge and management of LSCS patients

Variable	Subdomain	N (%)
Type of discharge	Purulent	48 (60%)
	Seropurulent	13 (16.3%)
	Serous	19 (23.8%)
Management Methods	Dressing	53 (66.3%)
	Resuturing	27 (33.8%)

Among 80 patients, 17 (21.25%) patients had sterile culture. The most common bacteria grown on culture was coagulase negatively streptococci 36.3% followed by gram positive and acinetobacter 30% and 8.8% respectively (Figure 1).

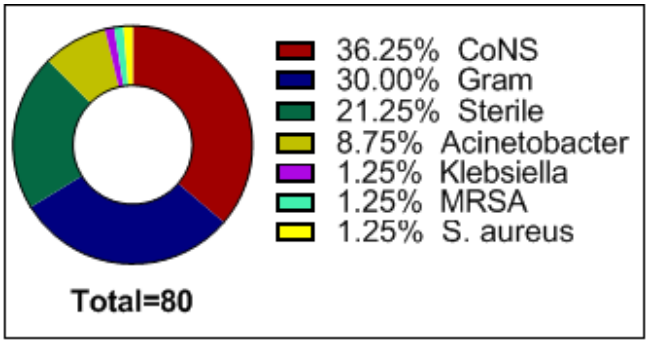

Figure 1: Microbiological profile of the swab collected from infected surgical site.

Among total 160 patients, 25 (31.2%) patients in the cases were admitted to ICU/HDU which was significantly higher compared to the control group in which 9 (11.2%) were admitted to ICU/HDU. The mean hospital stay was 16 ± 8.25 days in case group which is significantly higher compared to the control group in which mean hospital stay was 5.38 ± 1.38 days (Table 3).

Table 3: Outcomes in the control and case groups

Variable	Subdomain	Control	Case	P Value
ICU/HDU admission	Yes	9 (11.2%)	25 (31.2%)	0.002*
	No	71 (88.8%)	55 (68.8%)	
Hospital stay duration		5.38 ± 1.38 days	16 ± 8.25 days	0.000*

4. Discussion

In our study, 48 (65%) patients with SSI belongs to the rural residence. It shows that patient with SSI were more from rural setting. This is known fact that people residing in rural areas are relatively uneducated, lower socioeconomic status, with less awareness about self-hygiene and health. Most of the patients are anaemic due to nutritional deficiency, multiparity with less prenatal care, so may be harbouring a prenatal risk factor for SSI and when these patient reach hospitals in emergency the priority is to deliver the patients than to investigate the other factors. Hence health care professionals (obstetricians) should their eyes open during managing these patients. Molla et al observed that urban patients were more in SSI group than rural group (13) .

In our study, most c-section were performed at term i. e., 75 (93.8%) in control group and 72 (90%) in case group. Preterm c – section is performed due to any antepartum complication like abruption, antepartum eclampsia, prom, mal presentation of fetus. Pre term c-section were less in number in our study. Similar result was observed in a study done by Gomaa et al (12) and Farret et al (14) where gestational age at the time of C-section do not show any correlation with SSI.

In our study, we do not find any significant difference on account of gravidity between the control and case. However, Study done by Gomaa et al observed that there is increase number of SSI were presented in multigravida patients (12) . It can be due to decrease in immunity with age, laxity of abdominal wall and personal hygiene and the other medical conditions associated with advanced age.

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In our study, the most common bacteria grown on culture was coagulase negatively streptococci 36.3% followed by gram positive and acinetobacter 30% and 8.8% respectively. De et al in 2008 identified that gram negative bacilli was most common bacteria grown on culture of patient with SSI (15) . Jido and Garba et al in 2001 identified that staphylococcus aureus was isolated in 31.8% of cases (16) . Watts et al (17) and Martens et al (18) stated that post caesarean infection is commonly polymicrobial. Pathogen isolated from infected wounds and the endometrium include E. coli and other aerobic gram-negative rods, group B endometrium include streptococcus and other streptococcus species, enterococcus faecalis, staphylococcus aureus and coagulase negative staphylococci.

In our study we found that patients who were admitted in ICU/HDU were more prone to develop SSI. This can be due to high infection rate in ICU, and patient requiring admission in ICU are sick patient and kept in ICU for close monitoring. Invasive intervention like intubation and multiple venous sampling lodges the infection in body. Less mobilization or immobilization due to unconsciousness makes the patient more vulnerable and co existing morbidity itself is a risk factor.

The treatment of SSI is very challenging despite of the knowledge and proper management. The incidence of SSI post C-section is 13 % in India. It not only costs the extra burden of patients in hospitals with increase the maternal morbidity but is also a breach in confidence of doctor patient relationship and on the hospital itself. Thus, too much of counselling on daily rounds and extensive debriefing to continue the treatment in same hospital and have seen many patients demands discharges from the hospital to get treatment in other hospital. One patient in our present study was absconded also.
And after having a thoroughly knowledge of risk factors which can be modified by surgeon, strict adherent to hospital infection control policy, by having regular hospital infection control committee meetings, proper education to the health workers, can decreases the SSI following C-section.

5. Conclusion

Post caesarean surgical site infection is the one of the common causes of maternal morbidity and mortality. This also leads to increase in the cost of treatment and burden to hospital. A proper assessment of risk factor that predispose to SSI and their modification may help in reduction of SSI rates. Frequent antimicrobial audit and qualitative research could give an insight into the current antibiotic prescription practices and the factors governing the same. We cannot change the intrinsic risk factors (patients related) like age, parity, socioeconomic status, MI, history of previous c section and thickness of abdominal fat but we can still try to manage her medical condition and modify her operation related risk factors like duration of surgery, type of surgery, excessive blood loss during the surgery. Prophylactic antibiotics have been shown to reduce infectious morbidity for most obstetrical surgery.

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