Surgical Site Infection Following Caesarean Section in a Tertiary Care Hospital

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ABSTRACT

BACKGROUND

Surgical site infection (SSI) is an infection that occurs after surgery within 30 days in the part of the body where the surgery took place. Some of the common symptoms are: drainage of cloudy fluid from the surgical wound, pain or tenderness, localized swelling, redness, and raised body temperature. Lack of data on surgical site infection among women who underwent caesarean section (C/S) initiated us to determine the incidence of surgical site infection and evaluate various risk factor associated with it.

METHODS

This is a retrospective randomized case control conducted among patients undergoing LSCS (for various indications) from post-operative ward of GMCH between 1/7/2018 and 30/6/2019. Out of all surgical site infection cases, 370 cases were selected randomly. For every case of surgical site infection, another patient who did not develop surgical site infection under same circumstances was selected as control from the same ward and data was collected.

RESULTS

The incidence of SSI is 7.74% in Guwahati Medical College. Study shows high PROM, number of PV examination, prolong labour, increased surgical time, increase BMI are risk factors for wound complications.

CONCLUSIONS

PROM, high BMI, increased duration of surgery, prolonged labour are the independent risk factors for surgical site infection.

KEYWORDS

Caesarean Section, Surgical Site Infection, PROM, Prolonged Labour

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DOI: 10.18410/jebmh/2020/1

Financial or Other Competing Interests: None.

How to Cite This Article:
Dutta BK, Basumatary BK, Sarma A. Surgical site infection following caesarean section in a tertiary care hospital. J. Evid. Based Med. Healthc. 2020; 7(1), 1-5. DOI: 10.18410/jebmh/2020/1

Submission 22-11-2019,
Peer Review 26-11-2019,
Acceptance 10-12-2019,
Published 01-01-2020.

BACKGROUND

In obstetrics, Caesarean section (CS) rates have increased globally during the past three decades. With increase in caesarean section rate, incidence of surgical site infection also increased significantly. In USA, CS was the most commonly performed major surgery in hospitals in 2010 following a 41% increase in the incidence over 13-years period. The overall rate of caesarean section delivery in 2015-16 is approximately 17.2% in India, which was 8.5% in 2005-06. However, the caesarean section rate is estimated to be low in rural areas (12.9%). Surgical site infections are one of the main complication of caesarean section and are associated with elevated health care costs and maternal morbidity. Numerous studies had been conducted worldwide on surgical site infection following caesarean section.

In a study conducted in Eutopia, 847 women who have gave birth by caesarean section were followed up over three years period at Lemlem Karl hospital[1] from July 1, 2013 to June 30, 2016, the magnitude of surgical site infection was 6.8%. In the multiple logistic analysis; duration of labour, rupture of membrane prior to caesarean section, and types of abdominal incision were significantly associated with high incidence of SSI ($p < 0.05$). Mothers who were in labour for >24 hr. before caesarean section were 3.48 times higher risk for surgical site infections than those <24 hr. AOR=3.48; 95% Cl (1.25, 9.68). The chance of developing surgical site infections that had rupture of membrane before caesarean section was 3.68 times higher than intact membrane (AOR=3.678; 95% Cl (1.13, 11.96).

A retrospective case-control study conducted in Aminu Kano Teaching Hospital, Kano, Nigeria,[2] on surgical site infection (SSI). The cases were the patients whose CS was complicated by SSI; they were matched by other patients delivered by CS who had had no SSI as controls. Hospital records of cases and controls were compared. The incidence of SSI was 9.1%. Most of the cases were preceded by prolong labor, with long operation time and heavy blood loss. *Staphylococcus aureus* sensitive to cephalosporins was the most frequently isolated pathogen. Other organism isolated are more gram negative organisms like E. coli, Proteus mirabilis, Pseudomonas and *Klebsiella* in CS wound infections. Strategies for preventing prolonged obstructed labor and appropriate antibiotic prophylaxis may prove effective.

In a study conducted at Kirehe District Hospital in Rwanda,[3] prevalence of SSI on post-operative day 10 was 10.9 percent (60 women). In the multivariable analysis, the following factors were significantly associated with SSI: bodyweight more than 75 kg (odds ratio (OR) 5.98, 1.56 to 22.96; P = 0.009); spending more on travel to the health center (OR 2.42, 1.31 to 4.49; P = 0.005); being a housewife compared with a farmer (OR 2.93, 1.08 to 7.97; P = 0.035); and skin preparation with a single antiseptic compared with a combination of two antiseptics (OR 4.42, 1.05 to 18.57; P = 0.043). Receiving either preoperative or postoperative antibiotics was not associated with SSI.

In a study, in Dhulikhel Hospital-Kathmandu University, Kavre, Nepal,[4] Department of Obstetrics and Gynaecology from July 2013 to June 2014, the incidence of surgical site infection was 12.6%. SSI was found to be common in women who had rupture of membrane before surgery (p=0.020), who underwent emergency surgery (p=0.0004), and the women who had vertical skin incision (p=0.0001) and interrupted skin suturing (p=0.0001) during surgery. SSI as Hospital-acquired infections add to functional disability and emotional stress of the patient and in some cases leads to disabling conditions that reduce the quality of life. The economic costs are considerable .One study reported by Ducel et al. (2002) showed that the overall increase in the duration of hospitalization for patients with surgical wound infections was 8.2 days. Prolonged stay not only increases direct costs to patients or payers but also indirect costs due to lost work. The increased use of drugs, the need for isolation, and the use of additional laboratory and other diagnostic studies also contribute to costs

Despite Surgical site infection being a relatively serious problem in our health institution, there are scanty published reports on the bacterial pathogens that are involved in SSIs in our local hospitals. The sporadic reports from the public sector hospitals are mainly from the Microbiology laboratory records which may not show the complete clinical picture. These reports from the records have been used to estimate the incidence of surgical site infection. Reduction of surgical site infection while minimizing the risk of antibiotic resistance is a challenge for health care system. Keeping all these in mind more studies are required to prevent surgical site infection. Most of the studies on surgical site infection following caesarean section conducted outside India. The data is lacking in incidence and in the knowledge of common pathogen causing SSI after caesarean section.

We wanted to determine the incidence of SSI following caesarean section in Guwahati Medical College and Hospital (GMCH) for the period from 1/07/2018 to 30/6/2019, identify the risk factors for SSI and also the common pathogen associated with SSI.

METHODS

This is a case control study conducted in the Department of Obstetrics and Gynaecology, GMCH, among patients undergoing LSCS (for various indication). All patients developing SSI following LSCS conducted in GMCH were included. Patients referred to GMCH post operatively after LSCS from other hospitals, patients having pre-existing skin infection and immunocompromised patients (AIDS, patient on steroid etc.,) were excluded from the study. Data of patients developing SSI were collected in proforma from time to time. For every case of SSI, an another patient who did not develop SSI under same circumstances were selected as control from the same ward and data are collected. Data were analysed to find out the incidence of SSI, various risk factor associated and to find out various bacteria involved in developing SSI following LSCS.

RESULTS

The study comprises of 370 cases who developed SSI following all LSCS conducted at the Department of Obstetrics and Gynaecology, GMCH from 1-7-18 to 30-6-19. The total number of LSCS conducted at GMCH from 1/7/18 to 30/6/19 was 8464,654 patients developed SSI before discharge from the hospital. The incidence of SSI IS 7.74%. Out of these cases, 370 cases are selected randomly for case control study. The incidence of SSI following emergency LSCS done for various indications was studied. The following table the different incident rates of SSI in cases of emergency LSCS done for various indications.

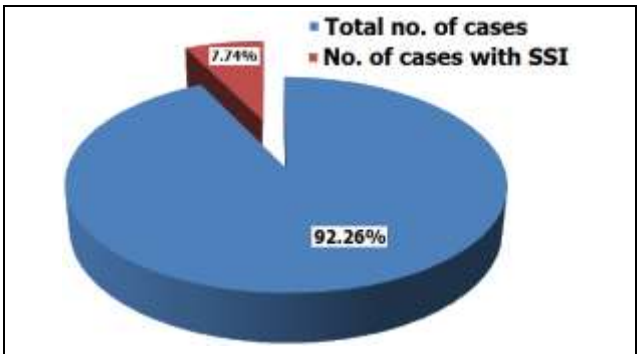

Figure 1. Incidence

Indication of LSCS	Cases with SSI	Control
Fetal distress	131(35.95%)	123(33.24%)
Post caesarean	76(20.64%)	33(8.91%)
Severe oligohydramnios	33(8.91%)	73(19.73%)
Prolong labour	50(13.51%)	31 (8.38%)
APH	15(4.05%)	12(3.24%)
Induction failure	13(3.51%)	30(8.11%)
Breech	14(3.78%)	30(8.11%)
Eclampsia	14(3.78%)	8(2.16%)
Obstructed labour	13(3.51%)	3(0.8%)
CPD	11(2.97%)	27(7.30%)

Table 1. Incidence of Wound Infection in Relation to LSCS for Various Indications

Risk Factor	Surgical Infection		Odd's Ratio	95% Confidence Interval	p value
	Yes	No			
BMI					
≥25	68	42	1.758	1.162 to 2.687	0.0096
<25	302	328			
PROM	104	65	1.835	1.299 to 2.593	< 0.0008
No. of PV examination					
<5	157	261	3.249	2.390 to 4.417	< 0.0001
≥5	213	109			
Pre-operative antibiotic	65	158	0.2860	0.2034 to 0.4034	< 0.0001
Prolong labour	50	31	1.271	1.033 to 1.508	<0.0335
Duration of Operation					
<40	168	261	2.879	2.121 to 3.905	< 0.0001
≥40	202	109			
Types of incision longitudinal					
Infraumbilical	333	330	1.091	0.6834 to 1.755	0.7099
Pfannenstiel	37	40			

Table 2. Risk Factor Associated with Surgical Site Infection Following Caesarean Section

DISCUSSION

This study indicated that 7.74% of the study participant had SSI. The reported rate of SSIs varies considerably amongst the studies conducted at different centres around the world (2.1-48.0%).[5] This figure is higher than the result reported from different studies which revealed that the rate of SSI in US hospitals was 4.1%, in New Zealand 5%, in Brazil 1.44%, China 0.7%, Pakistan 5.8%, Estonian university 6.2%, Saudi Arabia 4-2.4%, and in Nizwa, Oman 2.66%. This discrepancy could be due to the difference in socioeconomic status and health care delivery system.[6]

Similarly, in this study the magnitude of SSI is lower from the studies conducted in England, Nigeria and Jimma which, the rate of post C/S infection was 9.6, 9.3 and 8.55% respectively.[7] This variation might be due to the difference in study area and study participants. There are few Jordanian studies relating to SSIs following caesareans. Kaplan et al. reported that the rate of wound infections during hospital admission in 1,319 caesareans conducted between 1998 and 2002 was 8.1%.[8] Body mass index of more than 25 has been shown to affect the outcome of surgery. The study conducted by N Schneid Koffman and associates (2008) found that patient with high BMI were more prone to develop SSI.[9] Similar result were found in the study conducted by E Waisbren and associates[10] (2009). Our study shows high BMI is a risk factor for SSI (RR-1.758, 95% CI-1.162 to 2.687).

Premature rupture of membranes is associated with the large incidence of SSI. Study conducted by Devjani de (Department of Microbiology, Lady Hardinge Medical College), 39.2% of patients who had a premature rupture of membranes or prolonged rupture (for more than 24 hours before surgery) developed SSI.[11] 28.10% of patients in our study group who had a premature rupture of membranes or prolonged rupture before surgery, were subsequently infected. (RR-1.835, 95% CI-1.299 to 2.593). Patients with multiple per vaginal examination (more than 5) were found to be more predisposed to SSI as shown by many studies.[12] The study conducted by Filbert J. Mpogoro et at (2014) found that multiple per vaginal examinations is a significant risk factor for SSI in patients undergoing LSCS.[12] Multiple per vaginal examination make easy entrance of the organisms colonizing the cervix and vagina into the amniotic fluid during labour, which gets contaminated. During LSCS these contaminated amniotic fluid comes in contact with the wound site and predispose to the risk of development of SSI. Our study shows strong association SSI and number of PV examination. (RR-3.249, 95% CI-2.390-4.417)

Antibiotic prophylaxis in surgical patients has always been a matter of debate. For prophylactic antibiotics the current recommendation states that the parenteral antibiotic must be given within 2 hours of incision so as to attain high tissue and serum levels during surgery. In absence of preoperative antibiotic there is a significant increase in the incidence of SSI. Toor AA and Faroka MW 2015 found that appropriate and timely administration of antibiotic reduced surgical site infection by more than half.[13] Hospital stay was shortened by 1.3 days on average which results in considerable reduction in morbidity, mortality and costs.[13]

Several studies have shown that cases of prolonged labour are associated with higher incidence of SSI. The

studies conducted by Kelemu Abebe Gelaw and Amlaku Mulat Aweke (2015) have identified independent risk factors for surgical site infections were the duration of labor[14] AOR=3.48; 95% CI (1.25, 9.68) .Prolong labour was labour was found to be a significant risk factor for SSI in this study as well.

Operative duration has been as an independent and potentially modifiable risk factor for SSI. At an operative time greater than 40 min, which is a threshold that is well below the mean operative time, SSI incidence also increased by approximately two fold.[15] The finding relates to the pharmacokinetics of the antibiotic prophylaxis and to the greater bacterial wound contamination that occurs in lengthy clean- contaminated surgeries. In the present study, 54.59% of patients in the study group with prolonged duration of surgery exceeding 40 minutes got infected which was found to be statistically significant. Johnson et al. Classified duration of LSCS into <30 minutes and 31-60 minutes and found an increased rate SSI in the latter group.[16]

This study did not show any significant difference in the rate of SSI between the longitudinal skin incision group and the Pfannenstiel incision group. This may be due to the fact that most surgeon doing an LSCS for emergency indication preferred an longitudinal incision over Pfannenstiel incision as comparatively less time required les to access the uterus and deliver the baby.

Microorganisms Associated

Common causative organisms leading to post-LSCS SSI include Gram-negative, bacteria, anaerobes and *Staphylococcus aureus*. In our study the most frequently isolated organism was *Staphylococcus* species (40.54%) followed by Coagulase negative *Staphylococcus aureus* (21.83%) and *Klebsiella spp.* (18.65%). Study done by Njoku CO and Njoku AN (2019) the common isolates were S. aureus (37.3%), *Klebsiella pneumoniae* (27.1%) and *E.coli* (22.0%). Many other studies have reported similar findings of predominance of *Staphylococcus aureus* in wound infections.[17,18]

CONCLUSIONS

Risk factors like high PROM, number of PV examinations, prolonged labour, increased surgical time, increased BMI are risk factors for wound complications. Wound complications increase the duration of the hospital stay, which again increase the financial burden both on the patients and the hospital. Superficial wound breakdown is the commonest wound complication which was treated by re-suturing. Correcting malnutrition, anaemia, stabilizing diabetes and eradicating all infection such as urinary tract infection, proper preparation of skin, proper surgeons scrubbing, and using proper surgical technique can decrease the risk of post-operative abdominal wound infection. Knowledge of these risk factors would help the obstetrician in avoiding these complications and helps to decrease the maternal morbidity post operatively. Based on the sensitivity pattern of different isolates of bacteria, an empirical antibiotic therapy in post caesarean infection should be implemented.

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