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ORIGINAL RESEARCH ARTICLE

SURGICAL SITE INFECTION FOLLOWING CESAREAN SECTION AND ITS ASSOCIATED RISK FACTORS AT A TERTIARY CARE HOSPITAL IN CHITWAN

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ABSTRACT

Background: Surgical site infection following Cesarean Section is one of the major potential surgical complications with its incidence ranging from 3-15%. Morbidity and mortality are considerably increased after a surgical site infection placing a significant physical, emotional and economic burden on the patient herself. This study is aimed to identify the associated risk factors for postcesarean surgical site infection at a tertiary care hospital in Chitwan.

Methods: A descriptive cross-sectional study of 186 women who underwent a cesarean section was carried out in Chitwan Medical College Teaching Hospital, Chitwan, Nepal from 27thDecember 2019 to 19th February 2020. Data were collected from patients using a self-constructed questionnaire and their risk factors were studied.

Results: A total of 186 cases were studied and the incidence rate of surgical site infection was 13 (6.99%). The mean age was 26.13±4.94. Among the total cases, 87.10% of cases were literate while 12.90% of cases were illiterate. Out of total surgical site infection cases, infection was more prevalent (84.62%) among those with preoperative hospitalization of ≤ 24 hours and (53.85%) among those who stayed in the hospital for < 5 days.

Conclusions: Education level, duration of preoperative hospitalization and total hospital stay were found to be significant risk factors associated with surgical site infection and appropriate measures to address these risk factors help to lower the rate of surgical site infection.

INTRODUCTION

Cesarean Section (CS) being a lifesaving procedure for both mother and baby; is one of the most commonly practiced obstetrical surgical procedures. There are greater risks than benefits of cesarean section especially when it is performed without medical indication.[1] The rate of CS between 10-15% of total delivery is considered appropriate however there has been increasing rate of CS in both developed and developing countries globally,[2,3] with Asia having the second-highest absolute increase of 15.1% from 1990 to 2014.[4]

There are many short and long term medical and surgical complications associated with the CS procedure especially in women with limited access to comprehensive obstetric care.[5,6] Surgical site infections (SSI) which is defined as an infection occurring within 30 days of operation involving skin and subcutaneous tissue and/or deep soft tissues and/or any other parts of body opened/manipulated during operation[7]; is one of the major surgical complications following CS and its rate ranges from 3 to 15% worldwide.[8,9] Even though SSIs are possibly preventable, there has been shown to be increased maternal morbidity and mortality.[10,11]Additionally, it may increase the maternal length of stay and hospitalization costs causing a significant physical, psychological and economic burden to the patient.[11,12] In Nepal, limited information exists regarding the magnitude of postcesarean SSI. The aim of this study was to assess the incidence and identify associated risk factors for postcesarean SSI at Chitwan Medical College Teaching Hospital, one of the major tertiary care hospitals in Nepal.

METHODS

This is a descriptive cross-sectional, quantitative study. A total of 186 women who underwent a cesarean section during this study period in the department of obstetrics and gynecology were included. This study was conducted at Chitwan Medical College Teaching Hospital (CMCTH) from 27thDecember 2019 to 19th February 2020. Ethical approval was taken from the Institutional Review Committee (IRC) of Chitwan Medical College (CMC-IRC/076/077-050) and informed consent was also taken from the patients.

The present study follows the CDC 2020 criteria for analyzing

SSI.[7] SSI is considered if the infection has occurred within 30 days of the operative procedure, and involving skin and subcutaneous tissue of the incision site with at least one of the following: Purulent drainage from the superficial incision, organism(s) identified from an aseptically-obtained specimen from the superficial incision, superficial incision that is deliberately opened by a surgeon, patient has at least one of the following signs or symptoms: localized pain or tenderness, localized swelling, erythema, heat and diagnosis of a superficial incisional SSI by a physician

The sample size was calculated using the formula: N =[(z)^2*p(1-p)]/d2; where 'z' is 1.96 at 95% confidence interval, 'd' is margin of error at 5% and 'p' is prevalence rate of 12.6%[13] and adding 10% of the minimum sample as non-respondent, the desired sample size was calculated to be 186. Chitwan Medical College was purposively selected.

Validity & reliability: Pre-testing was done in Chitwan Medical College and Teaching Hospital among 19 recent clients who have undergone a cesarean section (10% of sample size) for testing the reliability using Chronbach's alpha. Content Validity of tools was tested by different faculty of gynecology department and School of Public Health of Chitwan Medical College as well as subject experts. The maximum number of valid literature was also reviewed.

Data collection technique: Face to face interview with the research participant.
Data collection tools: Self constructed interview schedule was used for data collection.

Data Analysis: After data collection, it was checked for accuracy and completeness. Data was coded and entered into Statistical Package for Social Sciences (SPSS) version 20. Descriptive statistics i.e frequency, percentage, mean and standard deviation were used to describe the findings. Inferential statistics i.e., chi-square test was used to determine the association between selected variables with the Surgical Site Infection (SSI). P-value <0.05 was considered significant. Fischer's exact test was used when more than 20% of cells had expected frequencies < 5. The analyzed data were presented in tables and graphs.

RESULTS

Out of a total 186 cesarean section during the study period, 13 patients (6.99%) were diagnosed as postcesarean surgical site infections. The mean age distribution of patients was 26.13 ± 4.94. Literate were 87.10% and 12.90% were illiterate (p=0.046). The majority of women (83.33%) were engaged in household activities (Table 1, 2).

Table 1: Incidence of surgical site infection

Variables	Frequency (%)
Patient with SSI	13 (6.99)
Patient without SSI	173 (93.01)
Total	186 (100.00)

Table 2: Demographic characteristics of patients

Variables	Frequency (%)	p-value
Age in years		
≤ 19	11(5.91)	**0.578**
20-34	162 (87.10)	
≥ 35	13 (6.99)	
Education		
Literate	162 (87.10)	**0.046**
Illiterate	24 (12.90)	
Occupation		
Housewife	155 (83.33)	**0.702**
Business	12 (6.45)	
Service	5 (2.69)	
Others	14 (7.53)	

Among the total SSI cases, 11 patients (84.62%) had less than 24 hours of preoperative hospital stay and 7 patients (53.85%) had less than 5 days of hospital stay after postcesarean surgical site infection which were statistically significant (p= 0.015 and p=0.048 respectively). The mean duration of total hospital stay was 4.07 ± 1.80 days. Out of 13 patients, one patient (7.69%) had undergone an elective cesarean section whereas 12 patients (92.31%) had an emergency cesarean section (Table 3).

Table 3: Surgical risk factors associated with surgical site infections

Variables	Total frequency (%)	p-value
Preoperative hospitalization		
≤ 24 hrs	97 (52.15)	**0.015**
> 24 hrs	89 (47.85)	
Total hospital stay		
< 5	142 (76.34)	**0.048**
≥ 5	44 (23.66)	
Type of surgery		
Elective	30 (16.13)	**0.391**
Emergency	156 (83.87)	
Preoperative hemoglobin		
< 11 gm/dL	50 (26.88)	**0.332**
≥ 11 gm/dL	136 (73.12)	
Blood transfusion		
No	141 (75.81)	**0.442**
Yes	45 (24.19)	
Smoking		
No	184 (98.92)	**0.016**
Yes	2 (1.08)	
Hair removal		
No	7 (3.76)	**0.440**
Yes	179 (96.24)	

Among the obstetric related risk factors, nulliparity (76.92%) and term gestation (84.62%) were found to be the most common. The majority of patients (69.23%) who had SSI had more than one per vaginal examination (Table 4).

Table 4: Obstetric risk factors associated with surgical site infections

Variables	Total frequency (%)	p-value
Parity		
1	108 (58.06)	**0.153**
≥2	78 (41.94)	
POG*		
Preterm	32 (17.20)	**0.946**
Term	153 (82.26)	
Post-term	1 (0.54)	
Onset of labor		
No	92 (49.46)	**0.805**
Yes	94 (50.54)	
Rupture of membrane		
No	136 (73.12)	**0.329**
Yes	50 (26.88)	
PV examination⁺		
0	47 (25.27)	**0.636**
≥ 1	139 (74.73)	
No. of prior LSCS		
0	142 (76.34)	**0.160**
≥ 1	44 (23.66)	
Infection		
No	143 (76.88)	**0.174**
Yes	43 (23.12)	
Hypertension		
No	166 (89.25)	**0.712**
Yes	20 (10.75)	
GDM‡		
No	178 (95.70)	**0.428**
Yes	8 (4.30)	

* Period of gestation

⁺ Number of per vaginal examination

‡Gestational diabetes mellitus

Table 5: Descriptive statistics of variables

Variable	Mean ± S.D.
Parity	1.49 ± 0.66
Per Vaginal examination	1.93 ± 1.69
Prior LSCS	0.27 ± 0.54
Preoperative Hemoglobin	11.72 ± 1.38
Total hospital stay	4.07 ± 1.80

Most of the patients were operated for meconium-stained liquor (21.51%), previous cesarean section (16.67%), low AFI (13.98%) and fetal distress (10.22%) (Figure 1).

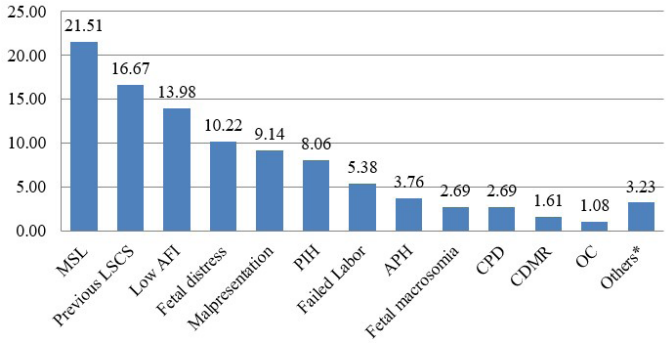

Figure 1: Indications of cesarean section

Note. MSL, meconium stained liquor; AFI, amniotic fluid index; PIH, pregnancy induced hypertension; APH, antepartum hemorrhage; CPD, cephalopelvic disproportion; CDMR, cesarean delivery on maternal request; OC, Obstetric Cholestasis

*Others include polyhydramnious, infections, twin pregnancy, Rh negative, fetal hydronephrosis and septate uterus

DISCUSSION

In this study, the incidence of surgical site infection following cesarean section was found to be 6.99%, which is consistent with other studies.[14,15] Globally, there is a wide range of SSI rates varying from 2.1% in Kuwait,[16] 5.5% in the USA,[17] 9% in India,[18] followed by high incidence rate up to 48% in resource-limited settings in Tanzanian.[19] In the national context, this study finding is relatively lower than the study conducted at Dhulikhel hospital (12.6%) and Nobel hospital (27.7%)[13,20]; whereas higher than the study done at Patan hospital (2.76%).[21]These studies indicate that the general SSI rate fluctuates broadly, in view of the study sample, prior comorbidities, uses of antibiotics as well as solid techniques for SSI documentation and reporting.[22]

Among various risk factors of developing SSI after CS, education level among women, duration of preoperative hospitalization and total hospital stay were significantly associated with surgical site infection in bivariate analysis (p<0.05). No demographic differences were noted with respect to age and occupation status. However, SSI groups had lower levels of education (p<0.046). People with lower education levels are more likely to have lower socioeconomic conditions, negligence in following medical advice and delay in seeking medical care. Similar finding was reported by Vallejo et al.[14]

Different studies have reported that the risk of developing SSI increases with premature rupture of membrane and primary LSCS.[15,23]Once the membrane gets ruptured, amniotic fluid is no longer sterile which may act as a transport media allowing bacteria to reach uterine and skin incisions, which might be the possible reason for the higher incidence of SSI in case of membrane rupture than those with intact membrane. [24] This study showed that risk of developing surgical site infection with rupture of membrane before the cesarean section was 1.7 times greater than those with intact membrane and incidence of surgical site infection in women who had undergone primary LSCS was 3.71 times more than those who had at least one previous LSCS, although it was not found statistically significant. The incidence of postcesarean surgical site infection among women who developed an infection (STDs, UTI) in their corresponding pregnancy was 2.07 times greater than those who did not develop such infection.

This study found a significant relationship between pre-operative hospital stay (p=0.015) and this finding is in accordance with the study done by Vijayan et al.[25] 47.85% of the patients in the current study had a preoperative hospital stay more than 24 hours. The total hospital stay was also significantly as-

sociated with SSI (p= 0.048). There were 6 patients (46.15%) of SSI with a prolonged hospital stay for more than 5 days. Eleven patients (84.62%) having SSIs were readmitted after being discharged. Vijayan et al. have found that there was a significantly increased risk of SSI in hospital stay more than 5 days with an odds ratio of 1.977.[25] Also, the median total stay in infected patients has shown to be increased approximately three to four times. This adds additional hospitalization costs; thus imposing a significant economic burden on the patients. [12]

In this study, 83.87% of the patients had undergone emergency LSCS. Emergency or elective CS is done in an indicated obstetric patient evaluating their co-existing medical condition. SSI was found to be more prevalent among the cases undergoing emergency CS due to the rupture of membranes and insufficient preparation time for precautionary measures imposing the patient at greater risk of bacterial contamination.[26,27] The study by Amenu et al. reported that the SSI rate was two times higher in patients undergoing emergency CS compared to that of elective surgery.[28] Similar findings were also observed by De D et al. (80.16%) and Shrestha et al. (90.2%). [13,27] Preoperative anemia is an important risk factor of surgical site infection.[29]In contrast to other studies, the current study does not find any significant association between anemia and surgical site infection. A study conducted in Nepal found an important association between preoperative anemia and SSI.[30]

Patients undergoing LSCS were admitted in the ward and daily vitals monitoring was done. Detailed history, general physical examination and investigations were conducted. The patients were advised to have a shower, shave their pubic hairs and were kept nil per os for eight-hour before surgery. The next day in operation theatre antibiotic prophylaxis intravenous Ceftriaxone 2 gm stat was administered usually 30 minutes before surgery. Preoperative skin preparation was performed using Povidone-iodine 5% and rectified spirit (90% Ethanol). All the patients were given Pfannenstiel incision and interrupted skin suturing with Nylon. Intravenous Ceftriaxone was continued till the first 24 hours postoperatively.

The limitations of this study include a lack of follow up of the patients in the long term which may have contributed to a lower rate of postcesarean surgical site infection in this study. Other various risk factors like Body Mass Index (BMI), American Society of Anesthesiologists (ASA) grade and duration of surgery could not be assessed. Also, the study was confined to one hospital only and the study period was short so the finding could not be generalized nationally.

CONCLUSION

SSI following the cesarean section is a preventable yet highly discomforting condition. There are myriads of risk factors for SSI and this study found education level, duration of preoperative hospitalization and total hospital stay as an independent risk factors associated with the development of SSI. Thus the evaluation of significant risk factors and early measures to mitigate those factors as well as development and strict implementation of appropriate protocols helps in the reduction of SSI and the burdens associated with it.

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