

Surgical site wound infection in relation to antibiotic prophylaxis given before skin incision and after cord clamping during cesarean delivery

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ABSTRACT

Surgical site infection is one of the most common complications following Lower Segment Cesarean Section, which accounts for prolonged hospital stay thereby increasing expense. Prophylactic antibiotics in cesarean section reduces surgical site infection significantly. The best protection is provided when tissue level of antibiotics are adequate before incision, without prejudice to neonatal infectious morbidity. The objective of this study was to compare the incidence of surgical site wound infection with prophylactic antibiotics given before skin incision and after cord clamping following delivery of baby. This was a prospective, hospital based study, in which hundred cases of cesarean deliveries who received antibiotics prophylaxis one hour before the skin incision were compared with another 100 cases where antibiotic was given after cord clamping following delivery of the baby. Surgical site infection occurred in 3% of women who received antibiotics prophylaxis before skin incision as compared to 6% in whom antibiotic was given after cord clamping. It was statistically not significant. ($p=0.465$).

Keywords: Surgical site infection, lower segment cesarean section, prophylactic antibiotics.

INTRODUCTION

Cesarean delivery is defined as the birth of a fetus through incisions in the abdominal wall (laparotomy) and the uterine wall (hysterotomy).¹ The cesarean delivery rate progressively increased throughout the world. In 1980, the cesarean delivery rate in England was 9%, increasing to 30% in 1992; and an was 21.3% in 2000.^{2,3}

Cesarean delivery is the single most important factor associated with postpartum infection and carries a 5-fold to 20-fold increased risk of infection compared with vaginal delivery.⁴ Following caesarean delivery, maternal mortality and infectious morbidity may result from a number of postpartum infections including endometritis, urinary tract infection and surgical site infection (SSI), all of which increase hospital stay and expense.^{5,6}

Approximately 1.7 million hospital-acquired infections occur in the USA annually, and SSIs account for 20% of these cases.⁷ However, there were reductions in wound infection and endometritis after prophylactic antibiotics.⁸

Traditionally, prophylactic antibiotics have been given after clamping umbilical cord to avoid masking signs of neonatal sepsis in the infant, but studies have shown that prophylactic antibiotics provide the best protection when tissue levels are adequate before incision.⁹ Pre-incision broad-spectrum antibiotics are more effective

in preventing SSI than after cord clamping, without prejudice to neonatal infectious morbidity.^{9,10}

The American Congress of Obstetricians and Gynecologists examined several large recent studies that administered antibiotics to mothers before and after caesarean delivery. The study concluded there was no evidence of greater risk to the babies when mothers received antibiotics before surgery. Yet there was an increased benefit for the mothers in receiving the antibiotics before surgery.

The objective of this study was to compare the incidence of SSI in two groups. In first group, antibiotic was given one hour before skin incision, and in another group antibiotic was given after cord clamping following delivery.

MATERIALS AND METHODS:

This was a hospital based prospective comparative study conducted at Nepal Medical College and Teaching Hospital, Kathmandu, in the department of Obstetrics and Gynaecology over a period of seven months (July 1st 2013 to January 31st 2014).

Permission was taken from the ethical review board of NMCTH. Two hundred women undergoing cesarean section for various indications at term were included in the study. The patients having signs of infections (fever, tachycardia, skin infections) or taking antibiotics before operation were excluded from the study.

In 100 cases of cesarean deliveries prophylactic antibiotics were given one hour before skin incision and in another 100 cases, antibiotics were given after cord clamping. Non-randomised sampling was done. Verbal consent was taken from the patients in the study. Prophylactic intravenous antibiotics used were the combination of ampicillin 250mg and cloxacillin 250mg along with metronidazole 500mg. Intravenous antibiotics were continued for 24 hours followed by oral antibiotics for a total of seven days. In the other group, similar antibiotics were given only after cord clamping. SSI was observed in both groups. Patients were discharged on the fifth day of surgery if there were no complications. All the patients were examined after 15th day of surgery in the Out Patient Department.

Data collection included total number of wound infections in both groups and their mean hospital stay. Wound infection was also compared in elective and emergency operation groups. The data regarding these women's age, gravida, gestational age, blood loss during operation, operating time and body mass index (BMI) were noted.

All the collected data were entered in Microsoft Office Excel Worksheet and statistical analysis was done using Statistical Package for Social Sciences (SPSS) version 16.0. Chi square test was used to find the association of SSI between antibiotics given before skin incision and after cord clamping. P value less than 0.05 was considered statistically significant.

RESULTS

Two hundred cases of cesarean section were taken for the study. Antibiotics prophylaxis was given one hour before operation for one hundred cases and after cord clamping for another hundred cases. Characteristics as regards to gestational age, operation time, blood loss during operation and BMI were comparable in both groups. The mean blood loss was 300±40.82 versus 328.38±78.61 ml and hospital stay was 5.46±4.13 versus 6.36±15.54 days. (Table-1)

Table-1: SSI with antibiotics before skin incision and after cord clamp in cesarean section in relation to gestational age, blood loss, operation time and hospital stay

	Antibiotic given before (n=100)	After cord clamping (n=100)
Gestational age (weeks)	39.67±0.47	39.33±
Blood loss during operation (ml)	300±40.82	328.38±78.61
Operation time (minutes)	65±1.29	59.16±14.83
BMI	24.53±0.23	24.2±0.26
Hospital stay (days)	5.46±4.13	6.36±15.54

Among 200 patients included in the study, nine cases had wound infection, so the incidence of SSI was 4.5%. Among 100 women in whom antibiotics were given before skin incision, 3 cases had wound infection (3%), and in the 100 cases antibiotics were given after cord clamping, 6 cases had wound infection (6%). (Table-2)

Table-2: SSI with antibiotics before skin incision and after cord clamp (n=200)

	Wound infection	No	Yes	P Value
Antibiotics				
Before incision		97	3	0.465
After incision		94	6	
Total		191	9	

Among these 200 patients, 149 had emergency Lower Segment Cesarean Section (LSCS) and 51 had elective LSCS. Among the emergency LSCS group, 3 out of 70 patients had SSI in whom antibiotics were given before skin incision, but 5 out of 79 patients had SSI in whom antibiotics were given after cord clamping (4.29% versus 6.33%) respectively. Similarly among the elective group; none of the patients who received antibiotics before skin incision had SSI in comparison to 1 out of 21 patients in whom antibiotics were given after cord clamping (0 versus 4.76%). (Table-3)

Table-3: SSI with antibiotics before skin incision and after cord clamp in emergency and elective cesarean section (n=200)

LSCS	Total patients	Wound infection		Total wound infection	P Value
		Before	After		
Emergency	149	4.29% (3/70)	6.33% (5/79)	8	0.453
Elective	51	0% (0/30)	4.76% (1/21)	1	

Among 200 LSCS cases; 74 had fetal distress, 43 were of previous LSCS and 28 had non progress of labor. SSI were found in 2.63% versus 5.56% in fetal distress, 0 versus 11.11% in previous LSCS and 11.11% versus 20% in non progress of labor. (Table-4)

Table-4: SSI with antibiotics before skin incision and after cord clamping in cesarean section in relation to indication for LSCS (n=9)

Indication for LSCS	Before	After
Fetal distress	2.63% (1/38)	5.56% (2/36)
Previous LSCS	0% (0/25)	11.11% (2/18)
Non progress of labor	11.11% (2/18)	20% (2/10)
Other indications	0	0

DISCUSSION

The 2011 National Institute for Health and Care Excellence guidelines on cesarean section recommends prophylactic antibiotics for cesarean section before skin incision. This recommendation was based on a meta-analysis that included two studies.^{9,10} This reduces the risk of SSI in cesarean delivery in comparison to prophylactic antibiotics given after skin incision without causing any adverse effects to the baby.

There was a reduction of SSI by 50% when antibiotics were given one hour before skin incision in comparison to the antibiotics given after cord clamping in the study. That is 3% in the case of antibiotics given before skin incision and 6% after cord clamping ($P = 0.465$). This may be due to adequate tissue level of antibiotic before skin incision. This result was statistically not significant. The results were similar among emergency and elective operations. ($P = 0.453$)

In a study done by Nupur et al, a reduction of SSI by 48% was found when prophylactic antibiotics were given one hour before cesarean incision versus after umbilical cord clamping. It was a multivariable analysis for reduction of post-cesarean SSI. It was seen that there was a significant reduction in SSI with prophylactic antibiotics before skin incision.¹¹ Similar result was found in the study done by Owen et al, in his multivariable analysis. Antimicrobial prophylaxis before skin incision remained associated with lower rate of wound infection (2.5% versus 3.6% before skin incision and after umbilical cord clamping).¹²

Non significant reduction in the rate of wound infection (RR 0.71; 95% CI 0.44–1.14) in preoperative group was found in a systemic review and meta-analysis of similar study done by Baaqeel et al. These studies were randomised controlled clinical trials.¹³

In most of the studies, similar results were found. Crystal, in his study compared prophylactic antibiotics given two hours before LSCS with three hours after incision. The result was 0.6% versus 1.4%.¹⁴ Similar to this study, Shaban had lower wound infection in the group in which antibiotic given before skin incision in comparison to antibiotic given after cord clamping in elective cesarean deliveries, however result was not statically significant ($p = 0.10$).¹⁵ Javadi et al and Sullivan et al, had SSI before skin incision and after cord clamping at 3.7% versus 6.4% and 3% versus 5% respectively.^{16,17} Costantine et al, found lower risk of wound infection when antibiotics were given before skin incision versus cord clamping.¹⁸ Brad et al, also had a similar report.¹⁹

In contrast to all the above studies Heesen et al, had a different result. He found a reduced risk of endometritis but not of total infectious morbidity or SSI with antibiotic administration before skin incision. This result is in contrast to the meta-analysis of National Institute for Health and Care Excellence guidelines. This result may be due to double-blind randomised controlled method used in this study.²⁰

The difference between this current study and previous studies is that, we used different antibiotics. In most of the studies, antibiotics used were third generation cephalosporins eg cefazolin, ceftriaxone etc. In this study, we used a combination of ampicillin plus cloxacillin along with metronidazole as it is endorsed by Government of Nepal for Safe Motherhood Programme.

This study showed the reduction of SSI if prophylactic antibiotics were given one hour before skin incision than after cord clamping, though the result of this study was statistically not significant.

Limitations of this study were a small sample size and non randomized selection of patients.

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