Original Article

Comparing Infectious Morbidity between Administration of Antibiotic before Skin Incision and after Umbilical Cord Clamping during Elective Cesarean Section

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Objective: To assess the differences in maternal infectious morbidity when cefazolin is administered prior to skin incision versus after clamping the umbilical cord in elective caesarean section. Infectious morbidities include febrile morbidity, surgical site infection, endometritis, and urinary tract infection.

Materials and Methods: The present study was a prospective double-blind randomized controlled trial of 92 pregnant women who visited Krathumbaen Hospital for antenatal care at 37 weeks of pregnancy, of whom elective cesarean section was indicated, between June and December 2020. The participants were randomly divided into two groups. Group A represented those who receive cefazolin prior to skin incision and Group B represented those received cefazolin after umbilical cord clamping. After the cesarean operation, data were collected from medical records, and each group would be observed for complications. Frequency, percentage frequency distribution, mean and standard deviation, independent t-test, Chi-square, and Fisher exact test were the statistical data utilized. The data were displayed in a descriptive statistical form following the analysis. The define p-value in the present study trial is p=0.05.

Results: Demographic variables were not different between groups. Findings revealed that nine (19.57%) pregnant women in group A and ten (21.74%) in group B experienced febrile morbidity, which was not statistically significantly different. Neither group had any postoperative surgical site infection, endometritis, or urinary tract infection.

Conclusion: Comparing post-operative infectious morbidity, there was no significant difference in the time when cefazolin was administered before skin incision or after umbilical cord clamping in elective cesarean section.

Keywords: Prophylactic antibiotic; Elective cesarean section; Infectious morbidity

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Cesarean section is a significant practice that is known to save mothers and infants. However, it can be a cause of postoperative infections, as reported in 1.1% to 25% comparing to vaginal delivery, which is 0.2% to 5.5%[1]. It is to note that the risks of patient likely to incur infection differed between emergency and elective cesarean section, with the incidence of postoperative infections at 7.5% to 29.8% and 5.5% to 17.3%, respectively. Predisposing factors of mothers that underwent emergency cesarean section include duration of membrane rupture, duration of labor pain before surgery, anemia, and obesity[2]. Currently, it is known and widely accepted that administering antibiotics to women undergoing the procedure whether in emergency or elective cases, can reduce infectious morbidity[1,3,4]. However, timing of antibiotic administration has been the subject of controversy. Studies states that it would be more beneficial to administer antibiotic 15 to 60 minutes prior to skin incision rather than after cord clamping[5-8]. Nonetheless, antibiotic given pre-incision can cross placenta to fetal circulation and raise the questioning of potential complications such as drug allergy, drug resistance, and masked infection of the newborn[1,9]. Elective cesarean section, as compared to emergency cesarean section, has lower rate of postoperative infectious morbidity. In elective cesarean section, antibiotic administered after umbilical cord clamping has been advocated by investigators to have similar efficacy without neonatal exposure[1,10,11]. The author

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Table 1. Patient demographics information

Characteristics	Group A received cefazolin prior to skin incision (n=46)	Group B received cefazolin after umbilical cord clamping (n=46)	p-value
Age (years); mean±SD	27.96±4.22	28.67±8.91	0.626**
Height (cm); mean±SD	158.87±19.31	160.42±15.49	0.672**
Weight (kg); mean±SD	68.21±15.31	66.87±6.59	0.587**
Place of residence; n (%)			
Inner suburbs	26 (56.52)	29 (63.04)	0.524*
Outer suburbs	20 (43.48)	17 (36.96)	
Marital status; n (%)			0.257*
Common-law marriage	2 (4.34)	6 (13.04)	
Registered marriage	40 (86.96)	38 (82.61)	
Divorce	4 (8.7)	2 (4.35)	
Nationality; n (%)			0.625*
Thai	36 (78.26)	34 (73.91)	
Burmese	10 (21.74)	12 (26.09)	
Highest qualification; n (%)			0.726*
Illiterate	4 (8.7)	5 (10.87)	
High school	42 (91.3)	41 (89.13)	
Occupation; n (%)			0.656*
Unemployed	16 (34.78)	14 (30.43)	
Employee	30 (65.22)	32 (69.57)	

SD=standard deviation

* Chi-square test, ** Independent t-test

was interested in studying the effect of antibiotic on the complications when cefazolin was administered at different timing as before skin incision and after umbilical cord clamping. The present study result could be used as a guideline and regimen to follow when antibiotic prophylaxis is used in elective caesarean section group.

Materials and Methods

The present study was a prospective double-blind randomized controlled trial (ethic No. 041/63) of 37 weeks or more pregnancy women who visited Krathumbaen Hospital, indicated for elective cesarean section. The participants had no labor pain or early sign of labor pain, no cervical dilatation, and there was no premature rupture of membrane (PROM) reported. The participants were recruited between June and December 2020.

Ninety-two pregnant women were randomly divided into two groups, group A, pre-incision (n=46), administered cefazolin 1 to 2 gm intravenously 15 to 30 minutes before skin incision, and group B (n=46), received cefazolin 1 to 2 gm intravenously right after clamping the umbilical cord. The dosage of cefazolin given depended upon the mother's weight, 1 gm of cefazolin was given to mothers who weighed below 80 kg, while 2 gm of cefazolin was given to mother who weighed 80 kg or more. A nurse anesthetist was the only care provider in the operating room who knew which group the participant was as she randomly assigned the time to administer cefazolin, either prior to skin incision or after cord clamping. Data were collected and analyzed from the medical records. After discharged, all mothers were appointed for post-operative visits seven days after delivery. History taking and physical examination were then performed, observed surgical wound, and stitch off. Frequency, percentage frequency distribution, mean and standard deviation, independent t-test, chi-square, and Fisher's exact test were statistical data utilized. The data were analyzed using IBM SPSS Statistics, version 23.0 (IBM Corp., Armonk, NY, USA) and displayed in a descriptive statistical form following the analyses. The define p-value was p=0.05.

Results

Patient's information was displayed as demographic and pregnancy information, cesarean section details, and postoperative infectious morbidity (Table 1).

Group A received cefazolin prior to skin incision and group B received cefazolin after clamping

Table 2. Pregnancy facts

Facts	Group A received cefazolin prior to skin incision (n=46)	Group B received cefazolin after umbilical cord clamping (n=46)	p-value
Number of gestation; n (%)			0.755*
G1	24 (52.17)	22 (47.83)	
G2	13 (28.26)	14 (30.43)	
G3	8 (17.39)	7 (15.22)	
G4	1 (2.17)	3 (6.52)	
Number of parity; n (%)			0.511*
P0	23 (50.00)	26 (56.52)	
P1	19 (41.30)	13 (28.26)	
P2	3 (6.52)	6 (13.05)	
P3	1 (2.17)	1 (2.17)	
History of miscarriage; n (%)			0.625*
None	36 (78.26)	34 (73.91)	
Prior miscarriage	10 (21.74)	12 (26.09)	
Number of previous C-section; n (%)			0.544*
0	30 (65.22)	29 (63.04)	
1	14 (30.43)	11 (23.91)	
2	1 (2.17)	4 (8.70)	
3 or more	1 (2.17)	2 (4.35)	
Number of antenatal visits; n (%)			0.557*
Less than 5	1 (2.17)	2 (4.35)	
5 or more	45 (97.83)	44 (95.65)	
Early ANC; n (%)			0.524*
During 1st TM	26 (56.52)	29 (63.04)	
After 1st TM	20 (43.48)	17 (36.96)	
Gestational age at delivery; n (%)			0.557*
37 to 40 weeks	44 (95.65)	45 (97.83)	
More than 40 weeks	2 (4.35)	1 (2.17)	
Indication for C-section; n (%)			0.687*
Pre-eclampsia	5 (10.87)	2 (4.34)	
Previous C-section	37 (80.43)	39 (84.78)	
Breech presentation	3 (6.52)	4 (8.69)	
Multiple gestation	1 (2.17)	1 (2.17)	
BMI classification; mean±SD			
Average BMI	29.02±7.31	27.95±8.42	0.517**
Hemoglobin level; mean±SD			
Average hemoglobin	12.16±0.77	12.49±1.12	0.103**

ANC=antenatal care; TM=trimester; BMI=body mass index; SD=standard deviation

* Chi-square test, ** Independent t-test

of the umbilical cord, as displayed on the patient demographics information table. The average age, height, weight, place of residence, marital status, nationality, and highest qualification were not significant different between the two groups.

The pregnancy facts data are shown on Table 2. Number of gestations, number of parities, history of miscarriage, number of previous cesarean section, number of antenatal visits, early antenatal care, gestational age at delivery, indication for cesarean section, body mass index (BMI), and hemoglobin level were not significant different between the two groups.

Childbirth information data are shown on Table 3. The cefazolin dosage was given equally between groups A and B. There were no significant difference of fetal presentation and number of childbirths between the two groups. However, there were more Pfannenstiel incision, pelvic adhesion,

Table 3. Childbirth information

Childbirth information	Group A received cefazolin prior to skin incision (n=46)	Group B received cefazolin after umbilical cord clamping (n=46)	p-value
Cefazolin dosage; n (%)			1.000*
1 gm	31 (67.39)	31 (67.39)	
2 gm	15 (32.61)	15 (32.61)	
Fetal position & presentation; n (%)			0.694*
Vertex	43 (93.48)	42 (91.30)	
Breech	3 (6.52)	4 (8.70)	
Types of incision; n (%)			0.002*
Pfannenstiel	29 (63.04)	42 (91.30)	
Low midline	17 (36.98)	4 (8.70)	
Pelvic adhesion; n (%)			0.017*
Present	7 (15.22)	17 (36.96)	
Absent	39 (84.78)	29 (63.04)	
Number of children born; n (%)			-
1	45 (97.83)	45 (97.83)	
2	1 (2.17)	1 (2.17)	
Total blood loss; mean±SD			
Average blood loss (cc)	514.35±129.44	592.74±168.36	0.014**
Operative time (minutes)	44.33±11.40	49.19±9.15	0.027**

SD=standard deviation

* Chi-square test, ** Independent t-test

Table 4. Compare the occurrence of complications between groups A and B

Complications	Group A received cefazolin prior to skin incision (n=46); n (%)	Group B received cefazolin after umbilical cord clamping (n=46); n (%)	p-value
Febrile morbidity			1.000*
Present	9 (19.57)	10 (21.74)	
Absent	37 (80.43)	36 (78.26)	
Surgical site infection			
Present	0 (0.00)	0 (0.00)	
Absent	46 (100)	46 (100)	
Urinary tract infection			
Present	0 (0.00)	0 (0.00)	
Absent	46 (100)	46 (100)	
Endometritis			
Present	0 (0.00)	0 (0.00)	
Absent	46 (100)	46 (100)	
Length of hospital stay (days)			0.617*
2	1 (2.17)	0 (0.00)	
3	43 (93.48)	45 (97.83)	
4	2 (4.35)	1 (2.17)	

* Chi-square test

total blood loss, and mean operative time in group B.

Nine mothers (19.57%) from group A and 10 mothers (21.74%) from group B suffered from febrile morbidity. However, neither group had any observed postoperative surgical site infection, endometritis, or urinary tract infection. The average length of stay in hospitals (LOS) was equal between groups A and B, which was approximately three days. To be exact, 43 (93.48%) patients in group A and 45 (97.83%) patients in group B stayed an average of 3.02 days (Table 4).

Discussion

Considering the characteristics of the groups, it was discovered that there was no significant difference between groups A and B. For cesarean section detail, although there is no significant difference in the fetal position and number of infants born in both groups, the type of skin incision, pelvic adhesion, total blood loss, and mean operative time were statistically significant different. There were more Pfannenstiel incision and adhesion in group B, which is causing more blood loss and operative time. There were no surgical site infection, endometritis, and urinary tract infection in either groups, similar to the study indicated by Witt et al conducted to investigate the effectiveness of antibiotic by comparing the incidence of infection when mothers received antibiotic or placebo. The results were reduction of infection in mothers who received antibiotic[4]. As a result, the present study proved the effectiveness of cefazolin, as an antibiotic prophylaxis against bacterial infection. Another factor was the nature of elective cesarean section procedure itself, in which the incidence of postoperative infectious morbidity is low compared to emergency cesarean section[2]. The present study, however, differed from the study by Malik et al[12], which compared infectious morbidity when ceftriaxone was administered before skin incision or after clamping of the umbilical cord during elective cesarean section. The study, in which ceftriaxone was used, disclosed that there were 9.1% of surgical site infection, 2.2% of endometritis, and 3.4% of urinary tract infection. Personal hygiene reason could be the cause of the different complications that occurred. In this study, the postpartum follow-up limited into seven days, which is a limitation of the present study. Findings revealed that nine participants (19.57%) from group A and 10 participants (21.74%) from group B reported the incidence of postoperative febrile morbidity. These findings differed from the study by Jakobi et al, which found just 9% febrile morbidity[8]. However, there was no significant difference in febrile morbidity between the groups. Therefore, the effect of cefazolin administered pre-incision or after umbilical cord clamping was not different. The findings of the present study were aligned with those of Kandil et al and Yildirim et al, both of which also investigated timing of antibiotics administration for a scheduled cesarean section, determining that there was no variation[10,11].

Conclusion

Comparing postoperative infectious morbidity, there was no significant difference in the time when cefazolin was administered either before skin incision or after umbilical cord clamping.

What is already known on this topic?

Perioperative antibiotic administration can effectively reduce postoperative infectious morbidity in elective caesarean section.

What this study adds?

Antibiotic given after umbilical cord clamping was equally effective compared to those given before skin incision without the risk of neonatal exposure.

Conflicts of interest

The authors declare no conflict of interest.

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