Section: Gynaecology

Original Research Article

TIMING OF PERI-OPERATIVE ANTIBIOTIC ADMINISTRATION IN C-SECTION AND THE RISKS ASSOCIATED WITH POSTOPERATIVE MATERNAL AND NEONATAL INFECTIONS

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ABSTRACT

Background: After cesarean section, the most common complication is the infection. As compared to vaginal birth, the risk of postpartum infection increases nearly five-fold after C-Section. In 1990, the c-section rate globally was 7%. However, over the years, this rate has increased to 21% worldwide today. After c-section, the use of prophylactic antibiotics has reduced the prevalence of maternal infectious complications and wound infection. According to large multi-centered studies, there is a clear association of the risk of surgical site infections (SSI) with the timing of antimicrobial prophylaxis (AMP). **Objective:** To evaluate the timing of peri-operative antibiotic administration in c-section and evaluating the risks associated with neonatal and maternal outcomes after the surgery. **Study design:** A prospective randomised controlled research This study was conducted at Bilawal Medical College for Boys Liaquat University of Medical and Health Sciences Jamshoro from January 2025 to January 2026.

Materials and Methods: This research was performed on singleton, live, term or near-term patients. The women included in this study were those who were undergoing either emergency or elective c-section delivery. The patients were divided into 2 groups. Group A was given an injection of Ceftriaxone 1 gram IV 30 to 60 minutes before the skin incision. Group B was given this injection after cord clumping. The time period of surgery was recorded. Spinal anaesthesia was given to perform all the procedures. Any complications seen intra-operatively were noted.

Results: There were a total of 160 females included in this study who were divided into 2 groups, having 80 patients in each group. Almost similar information was noted in both the groups for the demographic parameters. Hence, no significant difference was seen in terms of demographics. Similar indications for c-section were seen when both the groups were compared. Both the groups showed no significant difference in terms of maternal outcomes as well as neonatal outcomes. In group A, there was no case of endometritis reported while only 1 was reported in group B.

Conclusion: The timing of peri-operative antibiotic administration in c-section does not change maternal infectious morbidity.

Keywords: vaginal birth; prophylactic antibiotics; surgical site infections (SSI).

INTRODUCTION

After cesarean section, the most common complication is the infection. As compared to vaginal birth, the risk of postpartum infection increases nearly five-fold after c-section.[1,2] Due to infections, the surgical wound and pelvic organs are most likely to be affected. Usually after c-section, urinary tract infectious complications occur which are linked with an increase in duration of hospital stay and are a substantial cause of maternal morbidity.[3] In 1990, the c-section rate globally was 7%.[4] However, over the years, this rate has increased to 21% worldwide today.[5] According to the WHO, the ideal acceptable c-section rate is around 10% to 15% but today, it is 21% which is exceeding the ideal rate.[6] As compared to no treatment or placebo, after c-section, the use of prophylactic antibiotics has reduced the prevalence of maternal infectious complications and wound infection.

The principles of pre-surgical administration of antibiotics are already well established. However, there are still certain controversies.[7,8] An ideal antimicrobial agent should achieve effective tissue penetration, should not promote bacterial resistance in pathogenic organisms, and should possess a long half-life to make sure the surgical procedure is protected with a single dose.[9,10] Moreover, an ideal antimicrobial agent should not interfere with anaesthetic agents, should have low toxicity, and should be cost-effective. According to large multi-centered studies, there is a clear association of the risk of surgical site infections (SSI) with the timing of antimicrobial prophylaxis (AMP).[11,12] These studies observed that if antibiotics were administered within 30 minutes before surgical incision, lower infection rates were seen.

Recommendations are made by current evidence-based guidelines to administer prophylactic antibiotics before surgical incision.[13] However, there is an exception for c-section deliveries where after umbilical cord clamping, narrow-spectrum antibiotics are often administered. It is done due to risks related to potential neonatal exposure. This practice is based on the assumption that antibiotic levels in the neonate are reduced if the antibiotic administration is delayed, despite evidence showing plasma concentrations when given pre-operatively. The genital tract is the primary source of microorganisms and it is responsible for post-cesarean infections, especially in cases where membranes have ruptured. These infections are poly microbial in nature. Nevertheless, there were clinical signs of infection. Patients who had no complications were discharged on their 3rd day after the surgery. The follow-up period was 6 weeks postpartum to check if there are any infectious if antimicrobials are used inappropriately or excessively, it can lead to the selection of resistant organisms and changes in normal skin flora. This increases postoperative virulence. The optimal timing of antibiotic prophylaxis in c-section is examined by some limited randomised controlled studies.

We conducted this study to compare the timing of peri-operative antibiotic administration in c-section—before skin incision and after umbilical cord clamping—and evaluating the risks associated with neonatal and maternal outcomes after the surgery.

MATERIALS AND METHODS

This study is a prospective randomised control trial which was performed in the Department of Obstetrics and Gynaecology. Singleton, live, term or near-term patients were a part of this study. The women included in this study were those who were undergoing either emergency or elective c-section delivery. The sample was detected by simple randomisation to avoid biasness. The consent from the patients was obtained. The institute's Ethical Review Committee approved this study.

Exclusion Criteria: Patients with gestational diabetes mellitus (GDM) or diabetes mellitus (DM) were not included in this study. Moreover, patients with premature rupture of membranes (PROM), suspected chorioamnionitis, prolonged labor, urinary tract infection, obstructed labor, documented fever, and anemia were also not a part of this study. Furthermore, those who had known allergy to penicillin or cephalosporins or complicated pregnancies were also excluded.

All the necessary pre-operative investigations were conducted. The patients were divided into 2 groups. Both the groups were given an injection of 1 gram IV Ceftriaxone. Group A was given the injection thirty to sixty minutes before the skin incision. Group B was given this injection after cord clumping. The time period of surgery was recorded from the time of skin incision to complete skin closure. Spinal anaesthesia was given to perform all the procedures. The nursing staff and obstetrician assessed the estimated blood loss during the surgery. Any complications seen intra-operatively were noted. Similar postoperative care was given to both the groups. Patients were daily monitored for clinical signs of infectious complications. These complications include surgical site infection (SSI), fever, urinary tract infection (UTI), and endometritis. Appropriate investigations were performed when complications. The maternal outcomes included fever, wound infection, febrile morbidity, urinary tract infection (UTI), and endometritis. The neonatal outcomes included NICU admission, duration of stay

in NICU, neonatal sepsis, and Apgar score <7 at 5 minutes. Kolmogorov-Smirnov and Chi-square tests were performed to test normality and categorical variables. For group comparison, ANOVA was used. Student's t-test was used for continuous variables. Data was recorded in the form of mean and standard deviation. A significant p-value was <0.05.

RESULTS

There were a total of 160 females included in this study who underwent c-section delivery. All of them were divided into 2 groups of equal number of patients. Both the groups had 80 patients each. Table number 1 shows the demographics of the study population. The mean age in group A was 26.2 years while it was 26.4 years. Almost similar information was noted in both the groups for the demographic parameters. Hence, no significant difference was seen.

Table 1

Demographics	Group A	Group B	p-value
Age (yrs)	26.2	26.4	0.94
BMI (kg/m2)	24.6	24.7	0.83
Parity (N)	1	1	0.6
Gravidity (N)	2	2	0.75
Gestational age (weeks)	38.5	38.9	0.45

Table 2: Shows the indications for c-section

	Group A		Group B	
Indications	N	%	N	%
Elective c-section	5	6.25	5	6.25
Fetal Distress	21	26.25	14	17.5
Previous c-section	7	8.75	7	8.75
Cephalo-pelvic disproportion	19	23.75	22	27.5
Placenta previa	1	1.25	1	1.25
Protracted labour	22	27.5	23	28.75
Other	5	6.25	8	10
Total	80	100	80	100

Table 3: Compares both the groups in terms of surgical and obstetric variables

Variables	Group A	Group B	p-value
Time period of labour in mean (hrs)	10.5	10	0.78
Surgery duration	45.3	48	0.07
Estimated blood loss in mean (ml)	879	876	0.17
Time period of rupture of membrane in mean (hrs)	2.8	3.3	0.08
Vaginal examination (N)	3.3	3.4	0.93

Table number 4 compares the postoperative infectious morbidity. Both the groups showed no significant difference in terms of maternal outcomes. In group A, there was no case of endometritis reported. Only 1 case of UTI was reported in group A while 2 were reported in group B.

Table 4:

	Group A		Group B	
Maternal outcomes	N	%	N	%
Endometritis	-	-	1	1.25
Wound infection	5	6.25	8	10
Febrile morbidity	5	6.25	5	6.25
UTI	1	1.25	2	2.5

Table 5: Compares the neonatal outcomes

	Group A		Group B	
Neonatal outcomes	N	%	N	%
NICU Admission	13	16.25	13	16.25
Neonatal Sepsis (in number)	9	11.25	10	12.5
Duration of stay in NICU (days)	7		7.2	
5-minute Apgar score (mean)	9.06		9.08	

DISCUSSION

The main goal of antibiotics is not to sterilize tissues, but to lower the intraoperative microbial load to a level which is manageable by the patient's immune system.[14] When an antibiotic is administered in c-sections preoperatively, it results in substantial plasma levels in the neonate. This leads to delaying antibiotics until after delivery and umbilical cord clamping.[15]

According to the study of Costantine et al., patients who received antibiotics after cord clamping showed higher rates of surgical site infections and endometritis.[16] However, Zhang C et al. observed results in contrast to Costantine et al.[17] According to Zhang C el., there is no significant difference in infectious morbidity between antibiotics administered before the surgery and administration after cord clamping.

Our study showed no significant difference between all the maternal outcomes between both the groups; endometritis (p-value = 1.0), wound infection (p-value = 0.40), febrile morbidity (p-value = 0.76), and urinary tract infection (p-value = 0.50). Similarly, no significant difference was seen between all the neonatal outcomes as well between both the groups; NICU admission (p-value = 0.1), neonatal sepsis (p-value = 0.76), duration of stay in NICU (p-value = 0.66), and 5-minute Apgar score (p-value = 0.78). All these findings are similar to the study of Sullivan et al.[18]

From a clinical perspective, the results of our study shows that decisions should be made based on the protocols of the hospital and the condition of the patient.[19] Generally, it is recommended that antibiotics should be given before surgery in order to reduce the risk of surgical site infections. According to the study of Tita et al., the use of proper antibiotics is beneficial in reducing post-cesarean infections.[20] However, there are still concerns on the effect of antibiotics on the neonate.

There are certain limitations of this study. Vaginal colonization by group B Streptococcus and anaerobic organisms was not evaluated. Therefore, we could not provide targeted management for these infections. Secondly, a single antibiotic regimen was used. If a different antibiotic was used, there was a possibility that the results might differ.

CONCLUSION

The timing of peri-operative antibiotic administration in c-section does not change maternal infectious morbidity.

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Conflict in the interest

The authors had no conflict related to the interest in the execution of this study.

Permission: Prior to initiating the study, approval from the ethical committee was obtained to ensure adherence to ethical standards and guidelines.

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