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Single Dose Versus Multiple Dose Prophylactic Antibiotics in Cesarean Section in a Tertiary Care Hospital

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ABSTRACT

Introduction
Choice of antibiotics as prophylaxis has become crucial factor for morbidity of women after delivery and neonatal complication associated thereafter. The purpose of this study was to compare the efficacy of single dose versus multiple dose of ceftriaxone in cesarean section (CS).

Methods
A prospective experimental study was carried out in Universal College of Medical Sciences and Teaching Hospital, Tribhuvan University, Bhairahawa, from May 2015 to October 2016. One hundred patients who had undergone cesarean section were divided in two groups with fifty in each. Patients in group I were treated with single dose of ceftriaxone, whereas patients in group II were treated with multiple dose of ceftriaxone. The data were analyzed using independent "t" test, chi-square test as appropriate. A p-value of <0.05 was considered significant.

Results
The distribution of Emergency CS and Elective CS were 72% and 28% in prophylactic single dose group and 88% and 12% in postoperative multiple dose regime and was statistically non-significant difference between single and multiple dose ceftriaxone. One wound infection was observed in multiple dose ceftriaxone treated women as compared to single dose ceftriaxone treated women. Febrile morbidity (8%) and urinary tract infections (2%) were observed in postoperative multiple dose regimen as compared to prophylactic single dose regimen.

Conclusion
Prophylactic single dose of ceftriaxone was effective in reducing infective morbidity in patients with cost benefit, and also reduces chances of drug resistant in future.

Keywords
Ceftriaxone, cesarean section, morbidity, multiple, prophylaxis, single dose

INTRODUCTION

Cesarean delivery is defined as the birth of a fetus through incisions in abdominal wall (laparotomy) and the uterine wall (hysterotomy).[1] Inflammatory complications which follow the cesarean section can occur in 30 to 85% of operated patients.[2,3] The most frequent complications of the cesarean sections are endometritis, urinary infections, wound infections and peritonitis. Basic questions related to antibiotic prophylaxis are the timing of prophylactic administration of antibiotics, duration of antibiotic prophylaxis and the choice of antibiotics for antibiotic prophylaxis.[4]

The antimicrobial prophylaxis means to achieve sufficient tissue concentration of antibiotic before possible bacterial contamination in wound. Prophylactic antibiotics have usually been withheld until after the umbilical cord was clamped for preventing placental transfer to fetus. According to current recommendations, the literature supports usage of single dose of the first-generation cephalosporin immediately after clamping the umbilical cord.[5,6]

Prophylactic antibiotic reduces the incidence of endometritis, wound infection, post-partum febrile morbidity, and incidence of urinary tract infections following both elective and non-elective caesarean section.[7] Thus this may be the one procedure for which a single dose of prophylaxis is not as effective as two or three dose prophylaxis.[8] Preoperatively administration a single dose of antibiotics has been found to be effective in prevention of postpartum infection as of multiple doses.[9,10]

The main objectives of this study were to quantify the rate of postoperative wound infection, compare the efficacy of single dose of ceftriaxone against multiple dose of ceftriaxone in terms of prevention of infectious morbidities, mean duration of hospital stay and cost of antibiotic in cesarean section.

METHODS

This prospective experimental study was carried out in Universal College of Medical Sciences and Teaching Hospital, Bhairahawa from May 2015 to October 2016. The study was started after the approval by IRC. (UCMS/IRC/030/15). The sample size of 100 women who were randomly allocated in two groups I and II by simple card method. Patients in Group I were treated with Injection Ceftriaxone 1 gm intravenous 30 minutes before cesarean section. Patients in Group II were treated with Injection Ceftriaxone 1 gm administered intravenously immediately after skin closure and then post-operatively 12 hourly total of four doses. The inclusion criteria for this study were the cases undergone for elective and emergency cesarean section irrespective of age and parity held in the teaching hospital of Universal College of Medical Sciences and Teaching Hospital, Bhairahawa. The exclusion criteria were, any allergy to the antibiotics used in the study, use of antibiotics during the last 24 hour for other pathology, chorioamnionitis, febrile illness, premature rupture of membrane (PROM), prolonged or obstructed labor, moderate to severe anemia, postpartum hemorrhage, manual removal of placenta, diabetes and hypertension.

All data were collected in a pro forma prepared for the study. The participant were asked to randomly pick up the cheat from the box in which it was written single dose and multiple dose. Cases to be included in the study were selected from the Labor ward according to the inclusion criteria. Both verbal and written consent was obtained from the pregnant women and her guardian before the cesarean section.

The randomization was carried out at the beginning of the study. Hundreds patient who had undergone cesarean deliveries for various indications were divided in two groups with fifty in each. Patient with group I was treated with intravenous prophylactic single dose Ceftriaxone 1 gm 30 min before surgery administered by anesthetist. No more antibiotics were given in the postoperative period whereas patients with Group II was treated with intravenous 1 gm ceftriaxone immediately after skin closure by anesthetist and then post-operatively 12 hourly total of 4 doses and remaining doses were administrated with close monitoring in the postoperative ward. Efficacy of the treatment was compared in terms of postoperative infectious morbidities, wound infection and duration of hospital stay. No other antibiotic was given. In both groups the Foley's catheter was removed after 12 hours completion of cesarean section. The dressing applied in the theater set-up being removed on 3rd and 5th postoperative day. No further dressing was allowed for both groups.

All patients in both groups were observed daily in order to assess the following variables: axillary temperature, any sign of wound infection (erythema, swelling, discharge or tenderness), vaginal discharge, uterine consistency and height. The clinical signs of urinary tract infection were assessed and urinalysis was performed if any symptoms were present. The patients were discharged on day 5th postoperative if there was no infection or complication and asked to return on 10th postoperative day in order to assess the wound. The result was then filled up in the pro forma, so that it could be entered later in the master chart. Data were entered in a SPSS excel spread-sheet. Chi-square, independent t-test were carried out for testing the significance. P-value was calculated under predetermined level of significance 0.05.

Table 1. General distribution of cases undergoing caesarean section

Variables	Frequency (%)			p-value
	Group I	Group II	Total	
Age group (years)				
<20	7 (14%)	4 (8%)	11	0.65
20-40	31 (62%)	23 (46%)	54	
25-29	8 (16%)	18 (36%)	26	
>30	4 (8%)	5 (10%)	9	
Age (mean)	23.10±3.79	24.12±3.79		
Parity				
Primi	33 (66%)	31 (62%)	64	0.10
Multi	17 (34%)	19 (38%)	36	
Gestational Age				
<30-34	2 (4%)	1 (2%)	3	0.24
35-39	20 (40%)	33 (66%)	53	
>40	28 (56%)	16 (32%)	44	
Type of CS				
Elective	14 (28%)	6 (12%)	20	0.45
Emergency	36 (72%)	44 (88%)	80	

RESULTS

One hudnred patients meeting the inclusion criteria who underwent either elective or emergency cesarean section were included in this study with fifty on each arm. There was homogeneity among the study population in terms of their demographic characteristics such as age, parity, gestational age and type of cesarean section. The frequency distribution of Emergency CS and Elective CS were in 72% and 28% in prophylactic single dose group and 88% and 12% in postoperative multiple dose regime and was statistically significant difference between single and multiple dose of injection ceftriaxone (Chi-square test, p=0.45). Mean age of study group was 23.10 years and maximum frequency was observed 62% in age group 20-24 years in single dose group whereas mean age 24.12 and maximum frequency 46% was observed in multiple dose group and was statistically non-significant difference between single and multiple dose of injection ceftriaxone (Chi square test p=0.65) (Table 1).

The most common infectious morbidity was febrile morbidity followed by surgical site infection. Out of 50 cases in single dose regime, there was no febrile morbidity, urinary tract infection, while in multiple dose regimes there were 8% with febrile morbidity and 2% with urinary tract infection. Endometritis and puerperal sepsis was not found in both groups (Table 2).

Table 3 shows the distribution of indication in single and multiple dose treated women. The maximum frequency was observed in Nonreactive CTG with 24% in group I and 16% in Group II followed by Mal-presentation in 26% group I and 16% in Group II and was statistically non-significant difference between single and multiple dose of injection ceftriaxone (Chi square test p=0.19).

Table 4 shows the duration of hospital stay in the women treated with Group I and Group II. The maximum hospital stay was distributed for 5 days in 42% single dose treated cases and was statistically non-significant difference between

Table 2. Distribution of infectious morbidity

Infectious morbidity	Frequency (%)		
	Group I	Group II	Total
Febrile morbidity	0	4 (8%)	4
Endometritis	0	0	0
Urinary tract infection	0	1 (2%)	1
Wound infection	0	1 (2%)	1

Table 3. Indication of caesarean section

Indications	Frequency (%)		
	Group I	Group II	p-value
Non-Reactive CTG	12(24%)	8(16%)	0.19
Mal-presentation	12(26%)	8(16%)	
Oligo-hydrominos	9(18%)	4(8%)	
Fetal Distress	9(18%)	14(28%)	
Others	7(14%)	8(16%)	

Table 4. Duration of hospital stay

Hospital stays (Days)	Frequency (%)		
	Group I	Group II	p-value
4	10 (20%)	10 (20%)	0.84
5	21(42%)	25 (50%)	
6	11 (22%)	8 (16%)	
7	8 (16%)	7 (14%)	

single and multiple dose of injection ceftriaxone (T independent test, p=0.84).

DISCUSSION

Postoperative wound infection in obstetrics is higher as compared to other surgical specialties because 80-90% patients are unbooked and have poor socioeconomic status.[11] Cesarean delivery is the biggest risk factor for post-partum infectious morbidity. Cesarean delivery is often complicated by surgical site infections (SSI), endometritis and urinary tract infection (UTI) and antibiotic prophylaxis is known to substantially reduce their incidence. In this study out of total cases 80% had emergency and remaining 20% had elective cesarean section. The main indications for cesarean section were fetal distress, non-reactive CTG, malpresentation, oligohydraminos followed by previous LSCS and CPD.

In our study four cases (4%) developed postoperative febrile illness without any underlying causes. Similar study was obtained by Bhattachan[12] in which postoperative febrile morbidities were 4%. Also, the study is comparable with Shakya et al[9], Ahmed et al[13] and Alekwe et al[14] in which the post-operative febrile morbidities were 5%, 6.5% and 6.5% respectively.

Similar to our study Kahyihura et al[15] had found the frequency distribution of endometritis with both group was 100% absence of endometritis and the p-value is statistically non-significant difference. There were more cases of endometritis in the control group (n= 10) than in the study group (n=2), and this difference was statistically significant (RR 0.2, 95% confidence interval [CI] 0.15 to 0.94).[11] But, Ahmed et al.[13] had incidences of endometritis about 14–15% which was higher compared to the present study.

Surgical site wound infection is the most common postoperative complication observed following any surgery. Surgical site infection is a leading cause of hospital morbidity, increasing admission rates, doubling mortality rates, and increasing overall length of stay. Primary management is prevention through good surgical technique and patient optimization. The poor hygiene and nutrition plays important role in wound healing.

Our study shows 2% of wound infection which is comparable to findings of Bhattachan et al.[12] William et al.[16] and Shetty et al.[5] in which the wound infection rate were 1%, 1.5% and 1.6% respectively.

In the present study the frequency of urinary tract infections was 1(2%) in multiple dose group. Urinary tract infection is common infectious morbidity following cesarean delivery. Multiple per-vaginal examination, frequent urinary catheterization and failure to maintain aseptic technique during catheterization, bladder trauma and occult bacteriuria are risk factors for development of post-operative urinary tract infection.[17] Similar result was found by Grujić et al.[18] where one of the patient had urinary tract infection (2.2%) and almost similar study showed two cases (2%) in the single dose group developed urinary tract infection by Shakya et al.[9] The difference in the rate of UTI in single and multiple dose groups was not statistically significant (P=0.50).

Bhattachan et al.[12] found three cases (3%); two in the study group and one in the control group of urinary tract infection detected either by symptoms or on routine examination of urine which was higher than present study. This finding is comparable to study of Shetty et al.[5] and William et al.[16] and in which incidence of urinary tract infections were 2.4 and 3.5% respectively. On the contrary to present study Shivamurthy et al.[19] had higher rate of UTI i.e 4 (30%) and 6 (18.7%) which was different.

The matter of concern for every patient and their family is duration of hospital stay. Moreover when the hospital stay is prolonged due to infectious complication, it is associated with psychological upset as well as economic burden. Our study showed maximum hospital stay for 5 days in 42% in Group I and 50% in Group II treated cases. There were no cases of re-hospitalization on either group during the follow up period after 10th post-operative day of discharge. Similarly, the comparative study analyzed by Bhattachan K et al.[12] resulted the mean duration of hospital stay in their study was 4.40 and 4.42 days for study and control group respectively (p=1.00). This finding is comparable to study of Kayihura et al[15] in which the mean duration of hospital stay was 3.3 days and 3.6 days respectively. Hospital stay was almost the same in both groups which means that single dose versus multiple doses of antibiotic does not affect the hospital stay and is related to number of days required for wound healing.[10]

CONCLUSION

Prophylactic single dose of ceftriaxone group had lower infective morbidity. However, statistically significant reductions were not seen in respect to post-operative morbidity and hospital stay of the patients.

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CONFLICT OF INTEREST

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