

Single Dose Prophylactic Antibiotic in Caesarean Delivery and its Effect on Maternal Infectious Morbidity: A Prospective Observational Study

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ABSTRACT

Introduction: Caesarean delivery is the most common surgery performed in obstetrics. Antibiotics have revolutionised the surgical practise in this era. But multidrug resistance is a challenging issue in day to day practise. So, antibiotics have to be administered judiciously at the appropriate time with respect to surgery.

Aim: To determine whether the administration of single dose injection ceftriaxone 1 gm intravenously prior to skin incision was superior to administration at the time of cord clamping for prevention of post-caesarean maternal infection.

Materials and Methods: A prospective observational study was conducted in BLDE (DU) Shri BM Patil Medical College and Research Centre, Vijayapura, Karnataka, India. Patients undergoing caesarean sections for singleton term pregnancies both elective and emergency with intact membranes were

included in study during one-year period. Alternatively, group A received 1 gm injection ceftriaxone intravenously 60 minutes before skin incision and group B received at the time of cord clamping during surgery. Chi-square (χ^2) test was used for association between two categorical variables.

Results: Incidence of obstetric complications such as nausea (0.5% vs 0.0%) and wound infections (6.6% vs 4.1%) were more in patients who received a single dose of ceftriaxone at cord clamping than patients receiving the same antibiotic, preoperatively whereas, incidence of postoperative fever was more in group A (4.1%) than group B (3.3%) which was although not significant but is an important finding in this study.

Conclusion: Administration of single dose antibiotic either preoperatively or at the time of cord clamping was not statistically significant in reducing the incidence of wound infections.

Keywords: Endometritis, Postoperative fever, Surgical site infections

INTRODUCTION

The obstetrics caesarean delivery is the most common operative procedure done worldwide. In mid-19th century, all surgical procedures commonly resulted intraoperative and postoperative sepsis and death [1]. Antibiotic prophylaxis is beneficial in decreasing infectious morbidities in all pregnant women who undergo caesarean delivery as it is frequently complicated by surgical site infections, endometritis and urinary tract infections [2-4]. The Cochrane library recommends prophylactic antibiotics to women who undergo both elective and non elective caesarean delivery as there is 60-70% reduction in endometritis and 30-65% reduction in wound infection rate [2].

Perioperative antibiotic becomes very necessary to prevent infections. The main aim of perioperative prophylaxis is to attain the therapeutic levels of antibiotic agents in the tissue at the time of microbial contamination [5]. The drug of choice for antibiotic prophylaxis should be inexpensive, long acting and with low incidence of side-effects. The most common prophylactic drugs are of cephalosporin group. Some studies showed that even in clean or clean-contaminated elective surgeries, if the patient received perioperative prophylaxis, that is within 3 hours after skin incision, had 1.4% of wound infection compared to 0.6% of wound infection when preoperative prophylaxis was given 2 hours before skin incision [6].

There is widespread use of prophylactic antibiotics for caesarean delivery worldwide. Most of the institutions administer a single dose of antibiotic after clamping of umbilical cord in general [7,8]. However, these findings could not arrive to an agreement

regarding the timing of antibiotic prophylaxis owing to low resource set ups in India in caesarean delivery. Thus, this study was to review the recent evidence concerning the timing of prophylactic antibiotic during caesarean delivery and its influence on infectious morbidity.

MATERIALS AND METHODS

This was a prospective observational study conducted in BLDE (DU) Shri BM Patil Medical College and Research Centre, Vijayapur, Karnataka, India during March 2019 to February 2020. The research protocol was approved by the Medical Ethics Committee (BLDE(DU)/IEC/304/2018-19.). All patients provided informed written consent.

Inclusion criteria: All the pregnant women with singleton pregnancies with Gestational Age (GA) 28 weeks and above, undergoing elective/emergency caesarean delivery.

Exclusion criteria: Pregnant women having premature rupture of membranes, prolonged labour, obstructed labour and requiring peripartum hysterectomy and any additional surgery.

Sample Size Calculation

Sample size was calculated taking into account 41% reduction in the rate of endometritis and other infections compared with intraoperative administration of antibiotic at 95% confidence limits and 5% absolute error using formula, $n = z^2 p \times q / d^2$ [9].

A total of 377 pregnant women participated in this study, after fulfilling the inclusion criteria. Alternatively, 377 women were divided into Group A and Group B. Group A which included 194 pregnant women who received injection ceftriaxone 1 gm intravenously

administered preoperatively (60 min) prior to caesarean section and group B (183) who received intraoperatively at clamping of umbilical cord. Both the groups were compared and the clinical outcomes of patients in terms of nausea, postoperative fever and wound infections were studied.

STATISTICAL ANALYSIS

Microsoft office 2007 and Statistical Package for the Social Sciences (SPSS) software version 23 were used for statistical analysis. Continuous data was calculated through mean±Standard Deviation (SD) and categorical data, through Chi square test. The results were considered as statistically significant when p-value <0.05.

RESULTS

All studied patients were of age between 18-37 years. Mean age of the population at the time of diagnosis was 24.7±4.2 years. The mean length of GA was observed to be 35.3 weeks [Table/Fig-1].

Descriptive statistics	Range	Mean	SD
Age (years)	18-37	24.7	4.2
GA (weeks)*	16-42	35.3	4.6
Married life (years)	0-25	4.6	3.1
Pulse rate (per min)	0-120	84.0	10.8
Haemoglobin %	6.4-14.2	10.8	1.6

[Table/Fig-1]: Descriptive statistics of demographic factors.
SD: Standard deviation; GA: Gestational age

In both groups' majority of patients were presented with Hb >10%. In present study, highest number of patients were observed to be multigravida followed by primigravida in both preoperative (69.1%) and intraoperative (66.7%) groups.

Incidence of obstetric complications such as nausea (0.5% vs 0.0%) and wound infections (6.6% vs 4.1%) were statistically insignificant when both groups were compared. Incidence of postoperative fever was more in patients who received a single dose of ceftriaxone preoperatively (4.1%) than intraoperatively (3.3%). Wound infection rate though not statistically significant was more in group B [Table/Fig-2].

Parameters	Group A (n=194)		Group B (n=183)		p-value
	Mean	SD	Mean	SD	
Age (years)	24.7	4.2	24.7	4.3	0.930
Gestational age (weeks)	35.2	4.6	35.4	4.6	0.652
Pulse rate (per min)	83.8	10.2	84.3	11.4	0.689
Married life (years)	4.5	3.0	4.6	3.3	0.770
Haemoglobin%	10.8	1.5	10.8	1.6	0.912
	Number	%	Number	%	
Haemoglobin%					
<10	53	27.3%	52	28.4%	0.813
>10	141	72.7%	131	71.6%	
Delivery					
Elective	78	40.2%	77	42.1%	0.712
Emergency	116	59.8%	106	57.9%	
Gravida *p-value					
Multigravida	134	69.1%	122	66.7%	0.617
Primigravida	60	30.9%	61	33.3%	
Side-effects					
Nausea	0	0.0%	1	0.5%	0.303
Postoperative fever	8	4.1%	6	3.3%	0.665
Wound infection	8	4.1%	12	6.6%	0.292

[Table/Fig-2]: Comparison of Demographic factors and obstetric complications according to timing of antibiotic administration.
Chi-square test was used; SD: Standard deviation; p-value <0.05 is considered as significant

During study period, the incidence of wound infection in both pre and intraoperative groups was determined and then patients were divided based on presence and absence of wound infection. In wound infected patients, majority of patients (55%) were presented with Hb% <10. Most of deliveries observed in wound infected patients were emergency deliveries (85%) than elective deliveries (15%). The incidence of postoperative fever was more in wound infected patients (70%) than non infected patients.

In present study, a statistically significant association was noticed between incidence of infection and occurrence of postoperative fever, haemoglobin level and type of delivery [Table/Fig-3].

Complications	Wound infection present		Wound infection absent		p-value
	n	%	n	%	
Haemoglobin%					
<10	11	55.0%	96	26.8%	0.006*
>10	9	45.0%	261	73.9%	
Total	20	100.0%	357	100.0%	
Postoperative fever					
Yes	14	70.0%	0	0.0%	<0.001*
No	6	30.0%	357	100.0%	
Delivery					
Elective	3	15.0%	154	43.14%	0.004*
Emergency	17	85.0%	203	56.86%	
Total	20	100.0%	357	100.0%	

[Table/Fig-3]: Comparison of Obstetric complications according to incidence of wound infection.
Chi-square test was used and * p-value <0.05 is considered as significant

DISCUSSION

The present study was designed to determine whether the administration of single dose injection ceftriaxone 1 gm prior to skin incision was superior to administration at the time of umbilical cord clamping for prevention of post caesarean maternal infectious morbidity in low resource set up in India.

In present study, both the groups were similar with respect to the maternal age, GA, gravidity and type of delivery (elective and emergency), which is consistent with the study conducted by Francis C et al., who reported that there is no difference in both groups in terms of maternal age, GA, gravidity and history of caesarean section [10].

Present study suggests that the timing of single dose 1 gm intravenous ceftriaxone administration at caesarean, before skin incision compared with after umbilical cord clamp, may not significantly influence the prevalence of maternal postpartum infections. Incidence of obstetric complications such as nausea (0.5% vs 0.0%) and wound infections (6.6% vs 4.1%) were not statistically significant when both groups were compared. Whereas, incidence of postoperative fever was more in patients who received a single dose of ceftriaxone prior to skin incision (4.1%) than prophylactic antibiotic administration at the time cord clamping (3.3%), but the results were statistically insignificant. The present study findings were similar to those conducted by Thigpen B et al., and Kalaranjini S et al., who concluded that there was no difference in maternal infectious morbidity whether prophylactic antibiotics were given before skin incision or at the time of cord clamping [1, 11]. A meta-analysis on timing of antibiotic prophylaxis in elective caesarean delivery, observed that there was no difference on the effects of antibiotic prophylaxis either given before skin incision or after umbilical cord clamping. Both antibiotic prophylaxis before skin incision and that after umbilical cord clamping were recommended for elective caesarean delivery [12]. In contrast to present study findings, two meta-analysis studies has demonstrated that antibiotic prophylaxis with cefazolin for caesarean delivery that is given before

skin incision can significantly decrease the incidence of postpartum endometritis [9,13].

Several studies and meta-analysis have questioned upon the timing of antibiotic administration in caesarean delivery. American College of Obstetricians Gynaecologists opined that all women should be given prophylactic antibiotics before operating caesarean delivery [14]. The National Institute for Health and Clinical Excellence also supported the same results [15].

Limitation(s)

This study is a small study with small sample size. More studies with large sample size are required for establishing conclusive evidence on timing of antibiotic administration.

CONCLUSION(S)

Though, the present study shows no significant difference between preoperative and cord clamp group, it would recommend preoperative single dose antibiotic in caesarean delivery as it reduces the maternal infectious morbidity to a higher extent compared to cord clamp group in this antenatal population with low haemoglobin levels, poor hygienic conditions and low resource settings without much effect on neonates.

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