Original Article

A Comparative Study of Single Dose and Multiple Dose Antibiotic Prophylaxis In Caesarean Section

Dr. Poorvi Agarwal[1], *Dr. Harshal Nimbannavar*[2], *Dr. Prajakta Khose*[2], *Dr. Supraja Subramanian*[2], *Dr. Himadri Bal*[3]

[1]*Senior Faculty,* [2]*Resident,* [3]*Professor & Head of Unit, Department of OBGY, Dr. D Y Patil Medical College Hospital & Research Center, Pimpri, Pune- 411018, Maharashtra, India*

Abstract:

Background: Rampant antibiotic use brought about its own set of problems like the rise in incidence of antibiotic resistant strains, allergies and other complications of antibiotic use. Unfortunately, in many of our set ups we are still stuck in prolonged post-operative antibiotic regimes. This study aims to fill those lacunae and thereby aid our gradual shift away from over reliance on prolonged antibiotic usage in prevention of surgical site infection (SSI). Hence, we decided to investigate the efficacy of the use of a single prophylactic intravenous dose of antibiotic vis a vis multiple doses in reducing post-operative infective morbidity in caesarean sections. **Methodology:** The study included 200 patients at term, satisfying the inclusion and exclusion criteria, reporting to the labour room and undergoing caesarean section. The patients were then divided into two groups of 100 each by simple randomization. Patients in Group A were given a single dose IV antibiotics 30 minutes before the skin incision and Group B cases were given the first dose of IV antibiotics 30 minutes before the skin incision and continued for next 2 days, after that patient received oral antibiotics for next 3 days. **Results:** The present study did not show any significant difference in the post-operative infection incidence between the single dose and multiple dose schedule. **Conclusion:** Our study noted, there was no difference in the outcome as regards post-operative infectious morbidity in patients of both the groups. Hence, based on the findings of our study we conclude that single dose prophylactic antibiotic should be the norm for caesarean sections.

Keywords: Antibiotic prophylaxis, Caesarean section, Surgical site infection

Introduction:

TOne of the main causes of post-surgical morbidity across the world is surgical site infection.[1,2] An infection that occurs at or near a surgical incision within 30 days of the procedure is known as a surgical site infection.

The introduction of antibiotics in 20th century led to great improvement in surgical outcomes. From being a dreaded event, surgeries have become an accepted part of modern-day life due to the advent of antiseptic techniques and more importantly the advent of antibiotics.

Caesarean section is a major risk factor for postpartum infection with a possible 20-fold increase if compared with vaginal delivery.[3] Although general rules to prevent surgical infection, such as good surgical technique and antisepsis, are important, the use of antibiotic prophylaxis has been a major contributor in reducing the incidence of post-caesarean infection. It is said to have reduced the incidence by up to two-thirds.[4,5]

Corresponding Author: *Dr. Harshal Nimbannavar*

Email ID: *harshal40nimbannavar@gmail.com*

Address: *Department of OBGY, Dr. D Y Patil Medical College, Hospital & Research Center, Pimpri, Pune- 411018, Maharashtra, India*

ISSN No. *: (p) 2348-523X, (o) 2454-1982*

DOI: 10.46858/vimshsj.8301

Date of Published : *25th September 2021*

The efficacy of prophylactic antibiotics in the reduction of rates of postpartum infection among patients who underwent caesarean section has been demonstrated.[6] However there is a dilemma whether to use a single dose or multiple doses of antibiotic for prophylaxis for caesarean sections. In many studies the benefit of antibiotic prophylaxis in both emergency and elective caesarean section has been demonstrated. However, significant differences between single and multiple dosing regimens were not demonstrated.

Rampant antibiotic use brought about its own set of problems like the rise in incidence of antibiotic resistant strains, allergies and other complications of antibiotic use. Western countries have shifted the focus to improved aseptic precautions and better techniques rather than post-operative antibiotics. Unfortunately, in many of our set ups we are still stuck in prolonged post-operative antibiotic regimes. This study aims to fill those lacunae and thereby aid our gradual shift away from over reliance on prolonged antibiotic usage in prevention of SSI. Hence, we decided to investigate the efficacy of the use of a single prophylactic intravenous dose of antibiotic vis a vis multiple doses in reducing post-operative infective morbidity in caesarean sections. caesarean delivery and postpartum haemorrhage.

Methodology:

Sample size: 200 patients undergoing caesarean section at term were included for study. Patient's with Diabetis mellitus, Immunocompromised status, PROM, Prolonged active phase of labour [>12hrs], PPH and those requiring intra or post-operative blood transfusion, Anaemia [Hb<8 gm/dl], Obesity [BMI>30], Febrile morbidity with or without overt features of systemic infection are excluded from study. A written informed consent was obtained from all participants to the study.

A detailed history was taken including any antenatal record of diseases like diabetes, anaemia. If the patient was in labour, duration of labour, whether there has been rupture of membrane was enquired. A thorough general and systemic examination was carried out. Routine blood investigations like CBC, random blood sugar, CRP, urine routine and microscopic examination were sent.

The patients were then divided into two groups of 100 each by simple randomization. Patients in Group A were given a single dose of Injection Cefotaxime 1gm IV + Injection Metronidazole 500 mg IV infusion 30 minutes before the skin incision. Group B cases were given the first dose of Injection cefotaxime 1g IV + Injection metronidazole 500 mg IV 30 minutes before the skin incision and continued injectables for 2 days such as Injection cefotaxime 1g IV BD and Injection metronidazole 500mg IV TDS, after that for the next 3 days Tablet Cefixime 200mg 1BD and Tablet Metronidazole 400mg 1TDS were administered orally.

In both the groups the following parameters were monitored till 7th post-operative day:

1. Rise of temperature > 100.4º F on 2 occasions 6 hours apart excluding the first 24 hrs.
2. Pulse rate >100bpm
3. Skin wound was inspected after 48 hours, and subsequently if there was any discharge from the suture line.
4. Abnormal lochial discharge with or without uterine tenderness.
5. Any other features of infection like urinary tract infection, mastitis.

Post operative blood investigation for Hb/HCT were sent for all patients after 48hrs. Those having febrile morbidity and features of infection were further investigated with CBC, CRP, Urine routine and microscopy, urine/high vaginal swab/wound swab where discharge present for culture and sensitivity. Treatment as per the institutional protocol was started for febrile patients.

Standard statistical tests were utilized to compute the results. Unpaired t test and Chi-square test were utilized in calculating P value wherever necessary using GraphPad prism version.[6] The P value was considered as significant if lesser than <0.05 at 95% confidence interval.

Results:

Table 1: Age distribution

Age distribution	Group-1	Group-2
<18 years	0	1
18-22 years	25	29
23-27 years	46	44
28-32 years	25	22
33-37 years	4	3
38-42 years	0	1
P value		0.56

Table 2: Mean gestational age

Groups	Mean GA in weeks	Standard deviation	P value
Group 1	38.48	1.27	0.99
Group 2	38.47	1.25	

Table 3: Gravida score

Gravida score	Group 1 (No. of cases)	Group 2 (No. of cases)	P value
Primigravida	25	37	0.07
Second Gravida	40	32	0.24
=3 Gravida	35	31	0.55

Table 4: Indications of LSCS

Indications	Group-1	Group-2	P value
Previous LSCS	64	42	0.003
Abnormal presentation	15	19	0.57
Severe IUGR	5	13	0.048
Severe Pre-eclampsia	2	5	0.25
CPD	7	9	0.42
Fetal distress	5	9	0.15
BOH	2	3	0.65

Table 5: Comparison of pre-operative haemoglobin concentration

Hb	Group 1	Group 2
Mean	11.85	11.69
Standard Deviation	1.13	1.29
P value	0.38	

Table 6: Comparison of post-operative haemoglobin concentration

Hb	Group 1	Group 2
Mean	10.79	10.64
Standard deviation	1.13	1.28
P value	0.37	

Table 7: Incidence of febrile morbidity

Groups	Incidence of fever	Percentage
Group 1	16	16%
Group 2	13	13%
P value	0.55	

Table 8: Comparison of Total leucocyte count in febrile patients

TLC	Group 1	Group 2
Mean	16562.5	16746.15
Standard Deviation	5654.95	4039.52
P value	0.92	

Table 9: Urine evaluation in febrile patients

Total No	Urine RE Within normal limits	Urine Pus Cells >5/HPF	Urine culture Positive	P value
Group 1 (16)	16	0	0	0.17
Group 2 (13)	11	2	2	

Table 10: High vaginal swab culture sensitivity

Total No.	HVS culture Positive	HVS culture Negative
Group 1 (16)	1	15
Group 2 (13)	0	13

Table 11: Surgical site wound evaluation

	Group 1	Group 2
Wound discharge and gape	4	3
Percentage	4%	3%
P value	0.7	

Table 12: Wound swab culture sensitivity

Total No.	Wound swab culture Positive	Wound swab culture Negative
Group 1 (4)	2	2
Group 2 (3)	1	2

Discussion:

Infection following caesarean section constitutes one of the important causes of maternal morbidity across the world. Our study evaluated the efficacy of a single dose with multiple doses of antibiotic for prophylaxis against post-operative infection in caesarean sections. In this study, no difference in infection morbidity was found in the patients of both the groups. The mean age of patients in our study was 25.46 years and 25.13 years respectively in Group 1 and 2. The mean age in both the groups was matched and no significant difference was found. It was noted that majority of the patients in both the groups were between 23-27 years of age, followed by 28-32 age groups **(Table-1)**. The mean gestational age in Group 1 was 38.48 weeks and in group-2 was 38.47 weeks. There was no significant difference in mean gestational age between both the groups **(Table-2).**

As depicted in Table-3, total number of primigravidae was 25% and 37% in Group 1 and Group 2 respectively. 40% and 32% respectively were second gravida in Group 1 and Group 2. Multigravidae with three or more pregnancies were 35% and 31% respectively in Group 1 and Group 2. As evident, the gravida score of patients was matched in both our groups.

Previous LSCS was the commonest indication for patients undergoing caesarean section in both the groups, 63% and 42% in Group 1 and Group 2 respectively. This was followed by abnormal presentations in 15% and 19% of the patients in Group 1 and Group 2 respectively. Other indications were Cephalopelvic Disproportion, Fetal distress, severe pr eclampsia, severe IUGR and bad obstetric history. Between the two groups, patients with previous LSCS were significantly higher in Group 1 whereas patients with severe IUGR were significantly higher in Group 2. A study on prophylactic antibiotics by Kambo I et al[7] revealed major indications for LSCS included dystocia in 7.5%, fetal distress in 33.4%, history of previous LSCS in 29.0%, abnormal presentation 14.5% and pregnancy induced hypertension in12.5% of the patients (Table 4). In a study by Dasgupta A et al[8]. of all the women undergoing LSCS, 78% underwent emergency LSCS. Emergency LSCS was particularly increased with increasing BMI (OR: 2.6 and 7.6). In another study by Nikhil A[9] the indications of LSCS were previous one LSCS in 173 (42.09%) cases, fetal distress in 45 cases (10.94%); failure to progress in 45 cases (10.94%), previous 2 LSCS in 28 cases(6.81%),CPD and Breech in 26 cases (6.32%) each, mal-presentation & PIH in 8(1.94%) cases each, antepartum haemorrhage in 10 cases (2.43%); twin in 7 cases(1.7%) and oligohydramnios and/or IUGR in 16 cases (3.89%).

The mean pre-operative haemoglobin in Group 1 was 11.85 gm/dL whereas in Group 2 it was 11.69 gm/dL in our study. The mean post-operative haemoglobin in Group 1 was 10.64 gm/dL whereas in Group 2 it was 10.79 gm/dL. Thus, both the parameters did not show any statistically significant difference (Table 5 & 6). It is to be noted that a concentration of hemoglobin lesser than 11 g/dl is considered as anemia as per WHO criteria.[10] There may be a considerable fall in hemoglobin subsequent to LSCS due to blood loss. A study was conducted by Ashwal E et al[11] regarding maternal hemoglobin decline following 'uneventful' caesarean delivery. They noted that in an elective section the mean decline in Hb when compared to pre-operative level was 1 gm/dl whereas in non-elective sections this was 1.5 gm/dl and the difference was significant. There was similar decline in Hb in both our study groups. The mean decline in group 1 was 1.21 gm/dl and in group 2 main decline in Hb was 0.9 gm/dl. The amount of blood loss was comparable in both the groups in the present study.

The incidence of febrile morbidity post operatively was 16% and 13% in Group 1 and Group 2 respectively. No significant difference in incidence of fever was found between both the groups as depicted in (Table 7).

The infections subsequent to post-operative period are acute in onset with hematological parameter showing leucocytosis and neutrophilia.[12] The counts in febrile patients in both the groups of our study were raised above the normal physiological limit. It should also be kept in mind that there can be physiological increase in WBC count subsequent to delivery. In our study, the mean total leucocyte counts were 16,562 and 16,746 respectively in Group 1 and Group 2. The difference was not significant as noted in (Table 8).

Urine evaluation in febrile patients revealed significant pus cells (> 5/HPF) and positive urine culture in two patients in Group 2 whereas all patients in Group 1 had normal urine evaluation and none had a positive urine culture. The isolated organisms on culture in Group 2 were Enterococcus and E.coli (Table 9). It is to be noted that the difference in positive urine culture was not significant between the two groups. Though our study did not reveal any significant difference in two groups; studies by some authors have shown reduced incidence of urinary tract infection in patients receiving multiple doses of antibiotics.[13,14] In the present study, high vaginal swab culture revealed a single instance of MRSA infection in Group 1 out of the 16 febrile patients whereas high vaginal swab culture was negative for all the patients in Group 2 out of the 13 febrile patients. (Table 10).

The total incidence of surgical site wound infection in our study was seen in 7 cases out of the total 200. In Group 1, 4 patients had wound gape out of which culture was positive in 2 patients. One showed growth of MRSA and the other was E.coli. In Group 2, 3 patients had wound gape out of which culture was positive in only 1 patient which showed MRSA (Table 11 & 12). The incidence of post-operative wound discharge and skin gape was almost similar in both groups.

Conclusion:

In resource limited settings especially in India with a majority of the patients unable to meet health care expenditure and poor health insurance coverage, it becomes important to reduce possible health care costs and make it cost effective without affecting the quality of health of the patients. Moreover, high health care costs may compel the patients to being non-compliant with regard to requisite treatment, antenatal and postnatal check-ups and immunization for the child. Hence, there is a robust need to simplify the management of pregnancies, reduce the health care costs without compromising the safety and overall health outcome both in mother and the child.

Owing to the rampant use of prophylactic antibiotics, the problem of resistance to antibiotics is a major upcoming issue. As noted in our study, there was no difference in the outcome as regards post-operative infectious morbidity in patients of both the groups. Hence, based on the findings of our study we conclude that single dose prophylactic antibiotic should be the norm for caesarean sections. However, the respective hospital antibiotic policy should be locally framed keeping in mind the prevalent infections and resistance pattern of the microorganisms.

References:

1. Lang C, King J: Maternal mortality in the United States. Best Pract Res Clin Obstetrics Gynaecology. 2008;22:517– 531.
2. Mbaruku G, Bergstorm S: Reducing matrnal mortality in Kigoma, Tanzania. Health Policy Plan. 1995;10:71-78.
3. Burrows LJ, Meyn LA, Weber AM. Maternal morbidity associated with vaginal versus cesarean delivery. Obstet Gynecol. 2004;103:907–912.
4. Smaill FM, Gyte GM. Antibiotic prophylaxis versus no prophylaxis for preventing infection after cesarean section. Cochrane Database Syst Rev. 2010;1:CD007482.
5. Beattie PG, Rings TR, Hunter MF, Lake Y. Risk factors for wound infection following caesarean section. Aust N Z J ObstetGynaecol. 1994;34:398–402.
6. Burke JP. Infection control—a problem for patient safety. N Engl J Med 2003; 348:651–656.
7. Kambo I, Bedi N, Dhillon BS, Saxena NC. A critical appraisal of cesarean section rates at teaching hospitals in India. International journal of gynecology &obstetrics.2002 Nov;79(2):151-8.
8. Dasgupta A, Harichandrakumar KT, Habeebullah S. Pregnancy outcome among obese Indians-a prospective cohort study in a tertiary Care Centre in South India. International Journal of Scientific Study. 2014;2(2):13-8.
9. Nikhil A. Analysis of Trends in LSCS Rate and Indications of LSCS-A Study in a Medical College Hospital GMERS, Sola, Ahmedabad. International Journal of Pharmacy & Bio-Sciences. 2015 Jan 15;2(1).
10. World Health Organization (WHO). Preventing and controlling anemia through primary 24 health care: A guide for health administrators and program managers. 1989. http://www.who.int/nutrition/publications/micronutrients/anaemia_iron_deficiency/9241542497.pdf Accessed on: 23-Oct-2019.
11. Ashwal E, Wertheimer A, Aviram A, Orbach-Zinger S, Yogev Y, Hiersch L. Maternal hemoglobin decline following 'uneventful' cesarean delivery. J Matern Fetal Neonatal Med. 2016 Sep;29(18):3061-5.
12. Abramson N, Melton B. Leukocytosis: basics of clinical assessment. Am Fam Physician. 2000 Nov 1;62(9):2053-60.
13. Arbib N, Aviram A, Gabbay Ben-Ziv R, Sneh O, Yogev Y, Hadar E. The effect of labor and delivery on white blood cell count. J Matern Fetal Neonatal Med. 2016 Sep;29(18):2904-8.
14. Jakobi P, Weissman A, Zimmer EZ, Paldi E. Single dose cefazolin prophylaxis for cesarean section. Am J ObstetGynecol 1988; 158: 1049–52.