

Incidence of Infectious Morbidity Following Single Dose of Prophylactic Antibiotics In Women Undergoing Elective Cesarean Section

Tamanna Garg¹, Shashi Bala Arya², Shanti Sah², Rahul Kumar Goyal^{2#}

ABSTRACT

Introduction: Cesarean delivery is a major obstetrical surgical procedure aiming to save the lives of mothers and fetuses. The incidence of cesarean section varies between 10.0% and 25.0% in most developed countries.¹

Material and Methods: 80 cases for elective cesarean section admitted in ward/labour room of Department of Obstt and Gynae, SRMSIMS were studied to determine the incidence of infectious morbidity, i.e., UTI, SSI, puerperal sepsis and endometritis on different occasions that are immediate postoperatively, 48 hours post-operative, on discharge (4–5th day) and upto 6 weeks post-partum.

Preoperative routine blood and urine examination were done to recruit low-risk patients.

Preoperative part preparation with betadine was done the night before surgery, followed by intraurethral catheterization with 3 swabs under all aseptic precautions.

Results: There is a relationship between the timing of administration of prophylactic antibiotics and infectious morbidity. On comparing demographic factors concerning infectious morbidity, a statistically significant p-value was observed with the women's age, parity and BMI.

Conclusion: Single dose of prophylactic antibiotics should be effective if given within 30 minutes of skin incision in an elective cesarean section, especially in women with mean age 26.2 ± 4.2 years, low parity and with mean BMI of 24.9 ± 2.4 (kg/m²). The neonatal outcome is not much affected on giving prophylactic antibiotics before cord clamping. Despite of prophylactic antibiotics aseptic technique during intraurethral catheterization and check dressing at 48 hours postoperatively of the surgical site is the most important factor in preventing infectious morbidity.

Keywords: Elective cesarean section, Prophylactic antibiotics.

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INTRODUCTION

Cesarean delivery is a major obstetrical surgical procedure aiming to save the lives of mothers and fetuses. The incidence of cesarean section varies between 10 and 25% in most developed countries.¹ In many countries, the frequency of cesarean section is on the rise mainly due to advanced maternal age.

As a surgical procedure, cesarean delivery may be accompanied by several infectious morbidity such as SSI, Endometritis, UTI, Febrile Puerperal morbidities. Incidence of infectious morbidity -Surgical site infection- 3%-15%. Urinary tract infection- 7–12%. Puerperal pyrexia- 2–7%. Endometritis- 2.5–8%

Because of the dual-source of infectious organisms (i.e., skin and vagina) in cesarean deliveries, it was found that other than parenteral antibiotics, interventions such as antimicrobial skin and vaginal cleansing agents are also effective.² The Centres for Disease Control and Prevention recommends that preoperative skin cleansing before cesarean delivery with an alcohol-based solution should be performed unless contraindicated.

Prophylactic antibiotics is defined as the antibiotics given to prevent infection and to treat contamination. Antibiotics are used routinely for pre, intra and post-operative phase of cesarean section. Concerns about the emergence of resistant strains of common bacteria in addition to increased virulence, have resulted in increased scrutiny of the use of antibiotics.³ The administration of prophylactic antibiotics is not intended to sterilize tissue but to act as an adjunct to decrease the intra-operative microbial load to a level which can be managed by the host innate and adaptive immune responses.⁴ The goal of antibiotic therapy is to achieve sufficient tissue levels during microbial contamination. The antibiotic of choice should be long-acting, focused on the bacteria likely to be contaminating the surgical site, cost-effective, and have a low incidence of adverse effects.⁵

Standard guidelines, including those by WHO,

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¹Junior Resident, ²Professor

Department of Obstetrics And Gynaecology, #Department of Microbiology, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly (U.P.), India

Corresponding Author: Shashi Bala Arya, Department of Obstetrics And Gynaecology, Shri Ram Murti Smarak Institute of Medical Sciences, Bareilly (U.P.), India, e-mail: drshashibala@gmail.com

ACOG, ICMR and NICE, recommend single-dose pre-incision antibiotic prophylaxis in uncomplicated cesarean deliveries, most of them also recommending cephalosporins as the preferred choice.⁶ Women receiving antimicrobial prophylaxis after umbilical cord clamping, those administered antimicrobial prophylaxes before skin incision had lower rates of wound infection (2.5% compared with 3.6%). Antimicrobial prophylaxis before skin incision said to harm neonatal infection rates as it is thought to develop antibiotic resistance in neonate much earlier. Hence the study was done to determine the incidence of infectious morbidity following single dose of prophylactic antibiotics in women undergoing elective cesarean section.

MATERIAL AND METHODS

It was a hospital-based observational study conducted in the Department of obstetrics and gynecology, Shri Ram Murti Smarak Institute of medical sciences, Bareilly on 80 women planned for elective cesarean section and those admitted in the ward and labor room from November 2019–May 2021.

Inclusion criteria

- Women between 20–40 years of age.
- Term pregnant women of any parity.
- Singleton pregnancy.
- For elective cesarean section.
- BMI (18.9 to 29.9).

Exclusion criteria

- Hypersensitivity to antibiotics.
- Uncontrolled diabetes.

Table 1: Demographic factors of study population

Baseline characteristics	Mean SD
Age group(years)	26.2 ± 4.20
Body mass index(kg/m ²)	24.92 ± 2.44
Parity	Second gravida > Primigravida
Gestational age	38.09 ± 1.21
Preoperative investigation	Hemoglobin 11.14 ± 1.05 TLC 8631.98 ± 2042.90 Urine RM Within normal limit

Table 2: Incidence of infectious morbidity in our study

Infectious morbidity	Clinically suspected (n-80)	Percentage (%)
Puerperal pyrexia	2	2.5
Symptoms of UTI	6	7.5
Endometritis	0	0
Surgical Site infection	6	7.5
Total	14	17.5

- Hb<9 g/dL.
- Immunocompromised women
- History of more than 1 cesarean section.
- Placenta previa.
- PROM.
- Known cases of genitourinary infections, heart disease, systemic illnesses, or any other major surgery.

Cases were recruited according to inclusion criteria and preoperative routine blood and urine analysis was done. After investigations night before the surgery vagina and abdomen of the patient was painted with betadine solution, and the patient was encouraged to take a bath in the morning of cesarean. Under all aseptic precautions, urethral catheterization done with 3 swab techniques in preoperative room. Single-dose of broad-spectrum prophylactic antibiotics given according to the local antibiogram before skin incision.

Daily clinical examination was performed in the post-operative period to note the appearance of any infectious morbidity such as temperature, tachycardia, wound infection, wound discharge, symptoms of UTI. Patient was followed up till 6 weeks post-partum for all the signs of infection.

RESULTS

46.25% cases were between 25 to 30 years of age with mean age 26.2 ± 4.20 years. The majority of cases were second gravida with a mean gestational age of 38.09 ± 1.21 weeks and a mean BMI of 24.92 ± 2.44 kg/m² belonging to low socioeconomic status.

Preoperatively mean hemoglobin was 11.14 ± 1.05 g/dL, mean TLC was 8631.98 ± 2042.90 and urine routine was within normal limits. Mean temperature was 96.98 ± 0.63 F, mean systolic blood pressure was 115.75 ± 5.75 mmhg diastolic blood pressure was 74.25 ± 4.97 mmhg and pulse rate was 81.35 ± 5.06 (Table 1).

Postoperatively, on follow-up at different occasions preoperative, immediate postoperatively, 48 hours later, and on discharge, 2.5% patients were found to have puerperal pyrexia, 7.5% had UTI and 7.5% had surgical site infection. Also, endometritis was not seen in any patients (Table 2).

In asymptomatic patients (n-66), most of them belong to age group of 20–25 years (83.3%) who were primigravida (75.5%) with gestation age 37–38 + 6 weeks (75.7%) with BMI of 18.9–23.9 kg/m² in 84.4% patients belonging to lower middle class of socioeconomic status. While most of the symptomatic patients (n-14) belong to 25–30 years (15.1%) of age with 42.8% of patients second gravida who were between 37–39 weeks period of gestation (50%) with BMI of 24-29-9 kg/m² (57.1%) belonging to lower class of socioeconomic status (Table 3).

Table 3: Comparison of demographic factors in asymptomatic and symptomatic patient

Parameters	Mean	Asymptomatic group (n=66)	Symptomatic group (n=14)	P value
Age group (years)	26.2 ± 4.20	55(83.3%)	2(14.2%)	0.0078
Parity	Second gravida > Primigravida	50(75.7%)	3(21.4%)	0.0067
Gestation age	38.09 ± 1.21	50(75.7%)	5(35.7%)	0.140
Socioeconomic status	Lower class	20(45.4%)	4(28.5%)	0.134
BMI(Kg/m2)	24.92 ± 2.44	56(84.4%)	6(42.8%)	0.0002
Time of administration of antibiotics	Within 30 minutes of skin incision	50(75.8%)	2(14.2%)	0.0003

Table 4: Microorganisms isolated from different cultures

	Frequency (n=80)	Percentage (%)
Sterile	4	0.50
<i>S. aureus</i>	3	0.37
<i>E. Faecalis</i>	2	0.25
<i>K.pneumonia</i>	1	0.12
<i>E.Coli</i>	2	0.25
<i>P. aeruginosa</i>	2	0.25
Total culture sent	14	

Table 5: Neonatal outcome of study population

Parameters monitored	Frequency (n=80)	Percentage (%)	
Sex	Male	48	60.00
	Female	32	40.00
Birth Weight (kg)	2–2.5kg	17	21.25
	2.5–3kg	63	78.75
	6–7	3	3.75
APGAR score	7–8	69	86.25
	8–9	8	10.00

Besides all the demographic factors significant difference is seen between asymptomatic and symptomatic when assessed based on the time of administration of prophylactic antibiotics. In asymptomatic patients, 75.8% received antibiotics within 30 minutes of skin incision while in symptomatic patients, 57.1% received antibiotics within 60minutes of skin incision. A significant p-value of 0.0078, 0.0067,0.0002 and 0.0003 was observed between asymptomatic and symptomatic patients when compared based on age group, parity, BMI and time of administration of prophylactic antibiotics.

Most common organisms isolated after culture sensitivity was *Staphylococcus aureus* (21.4%), while 28.5% of cultures were sterile. In 14.28% patients *E. coli*, *E. faecalis* and *P. aeruginosa* were isolated respectively on culture sensitivity (Table 4).

Out of 80 cesarean, 48 patients had a male child while 32 patients had a female child with appropriate weight for age with APGAR 7,8 at 1.5 min (Table 5).

DISCUSSION

It was observed that infectious morbidity decreases significantly with a single dose of prophylactic antibiotics.

The effectiveness of single dose of prophylactic antibiotics mainly belongs to the patient with mean age 26.2 ± 4.20 years, second gravida, gestation age 38.09 ± 1.21, mean BMI 24.9 ± 2.44, belongs to lower socioeconomic status, and where it is given within 30 minutes of skin incision.

In this study, a great majority of the patients, about (85%) were in the age range of 25 to 30 years, with mean age 26.2 ± 4.20 years. In contrast, Huam *et al.*⁷ in their study done on single dose prophylaxis in elective cesarean section, reported that the mean age of their study was 32.0 ± 4.7 years as elderly women were more susceptible for cesarean section compared to younger women.

In this study, we found the mean gestation period was 38.09 ± 1.21 (35-4 2) weeks. A comparable study Huam *et al.*⁷ reported the mean period of gestation was 38.03 ± 1.1 weeks which suggested that in elective Cesarean section, prevention of iatrogenic prematurity is the factor that is always of main concern and Bhattachan *et al.*⁸ reported the 76.0% cases of 37–40 weeks and >40 was 24.0% cases in their study.

Thakur *et al.* reported that patients belong to mean BMI of 23.6 ± 2.0 was 30.25%.⁹ The proportion of underweight and overweight was 21.63% and 78.37%, respectively in their study, as they studied the maternal and fetal outcome with prophylactic antibiotics in elective and emergency cesarean sections so maximum patients underwent emergency cesarean section due to obesity-related obstetrics complication. In this study, we observed that 56.25% patients belong to BMI group of 18.9-23.9kg/m2 (56.25%), i.e., normal height and weight ratio with mean BMI of 24.9 ± 2.44. Obesity increases the risk of pregnancy complications. We included most of the patients with normal BMI to recruit low-risk patients.

Hariharana and Bhadauria reported that asymptomatic bacteriuria was present in 47% of patients in their study and concluded that asymptomatic bacteriuria before cesarean section can be managed with prophylactic dose of antibiotics to prevent post-operative infection.¹⁰

We observed that majority of the patients 52(65%) received prophylactic single dose of broad-spectrum antibiotics within 30 minutes of skin incision. 18(22.5%) patients received 60–30 minutes before skin incision

and ten (12.5%) patients received 70–60 minutes of skin incision. Similarly, SOGC recommends that the timing of prophylactic antibiotics for Cesarean section should be 15-60 minutes prior to skin incision. No additional doses are recommended.¹¹

Out of 80 patients, 10 patients had positive culture reports. Of these 10 patients, one (1.25%) patient developed puerperal sepsis, four (5%) patients developed surgical site infection, five (6.25%) developed urinary tract infection. Our study observed that low-risk women undergoing cesarean section after prophylactic antibiotics are still at risk of developing infectious morbidity. Of all the infectious morbidity, UTI was the commonest one. To avoid UTI, intraurethral catheterization should be done with proper aseptic techniques.

Mohan *et al.* reported that out of 154 cases, only three cases had wound infection; the organisms isolated in wound infection were *E. faecalis*, *Pseudomonas* and *S. aureus*.¹² Korol *et al.* reported that *S. aureus* is the most common organism isolated in SSI, accounting for 15%–20% of cases.¹³ Gram-negative bacilli, coagulase-negative staphylococci, *Enterococcus species*, and *E. coli* are other organisms commonly isolated from surgical site infection. In our study, out of ten cultures *S. aureus* was isolated from three (21.4%) cultures, *E. coli*, *E. faecalis*, and *P. aeruginosa* were isolated from two (14.28%) cultures each.

In contrast to our study, Stephanie Owens *et al.* says prophylactic antibiotic was being administered after cord clamping, so it did not reach fetal circulation.¹⁴ Concerns of masking signs of sepsis in babies, developing resistance to antibiotics and masking organisms in blood culture because of the trans-placental transfer of the drug was the main reason for administering the drug after cord clamping. Our study concluded that on follow-up, up to 6 weeks post-partum, despite giving antibiotics before cord clamping perinatal outcome was favorable in all the neonates. No adverse events like neonatal sepsis, jaundice and NICU admission were reported.

CONCLUSION

Our study supports that a single dose of prophylactic antibiotics should be effective if given within 30 minutes of skin incision in elective cesarean section, especially in women with mean age 26.2 ± 4.2 years, low parity and mean BMI of 24.9 ± 2.4 kg/m².

Our results showed that the women's age, parity and weight are one of the guiding factors in deciding dose

and duration of prophylactic antibiotics.

So, our present study recommended that the prophylactic single dose of broad-spectrum antibiotics during elective cesarean section is safe, useful, cost-effective, and significant in preventing future antibiotic resistance.

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