

# Antibiotic prophylaxis for elective caesarean section – a clinical audit in tertiary care teaching hospital

Sowmya K, Suma KB

Corresponding author: Dr. Sowmya K, Associate professor, Department of OBG, JSS medical college and hospital, Mysore, Karnataka, India; Email: sowmyak@jssuni.edu.in

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## ABSTRACT

**Objective:** The objective of the study was to analyse whether an audit, formulating policies and reaudit will help to improve prophylactic antibiotic usage and increase uniformity among women undergoing elective LSCS. **Methodology:** A retrospective case note review was performed for all elective caesarean section occurring over a 3 month period. Guidelines were introduced to address deficiencies and the reaudit was done. **Results:** During the study total of 204 pregnant women underwent elective LSCS out of which 96 in where in audit cycle and 108 in reaudit group. Prophylactic antibiotic prophylaxis administration was 38.5% v/s 89.8% (audit v/s reaudit group). Out of those who received antibiotic in audit group 40% (15 cases) received antibiotic within 1 hour whereas in reaudit group 79 (81.4%) women received antibiotic within 1 hour. The antibiotic usage in the audit group varied from amoxicillin clavulonic acid to cefoperazone sulbactam to cefotaxime which was mainly based on the operating surgeon's preference (54% v/s 45.9%). In the reaudit group majority of the women received amoxicillin clavulonic 1.2 gm IV /Inj cefotaxime (89% v/s 10.3%). **Conclusion:** Conducting an audit on usage of prophylactic antibiotic in women undergoing elective LSCS will help to assess the antibiotic usage. Formulating an antibiotic policy for prophylaxis in women undergoing elective LSCS and conducting an reaudit is a simple but effective tool to improve prophylactic antibiotic usage.

**Keywords:** Audit, caesarean section, antibiotic prophylaxis.

Caesarean section is one of the commonly performed obstetric procedure. Following caesarean delivery (CD), maternal mortality and morbidity may result from a number of infections including endometritis, urinary tract infection (UTI) and surgical site infection (SSI) <sup>1</sup>. The use of prophylactic antibiotics in women undergoing cesarean section reduced the incidence of wound infection, endometritis and serious infectious complications by 60% to 70% <sup>2</sup>. ACOG has recommended that antibiotic be given within 1 hour before the caesarean section for maternal benefit <sup>3</sup>. A cochrane in 2014 has concluded that either penicillin or first generation cephalosporin gives protection against most common organism and gives adequate coverage <sup>4</sup>. WHO has concluded that has adequate randomised trials are not available the choice of such

antibiotic class should be informed by the local bacteriologic patterns of postcaesarean infectious morbidity, the availability of such antibiotic class, the woman's allergy history, the clinician's experience with that particular class of antibiotics, and its cost, however it has also recommended the use of penicillins or first generation cephalosporins <sup>5</sup>.

In spite of the guidelines several studies have shown that the hospital practices varies from no preoperative antibiotic to various different classes of antibiotics. The timing of the antibiotic also varied depending on physician preference with no uniform protocols across hospital <sup>6,7</sup>.

Clinical audit usually starts with a review of current clinical practice, progresses to setting standards for care as per a set guideline, monitoring practice against these standards, analyzing the findings and implementation of new

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practices<sup>8</sup>. Although audits are a useful tool to change clinical practice very few audits have been carried regarding antibiotic prophylaxis for caesarean section<sup>9</sup>.

Therefore, this audit was conducted to assess the use of prophylactic antibiotics in women undergoing caesarean section, and to assess compliance with available evidence for antibiotic prophylaxis in cesarean section. It was also planned to introduce changes in practice based on the observations of this audit and to re-audit our practice to assess the effect of the changes. The objectives of the study were to audit and implement the use of prophylactic antibiotics in women undergoing elective caesarean section.

**Materials and methods**

It was a prospective observational study. All consecutive women who undergo elective cesarean section during the period of Jan 2019 to March 2020 in the OBG department and who fulfil the inclusion and exclusion criteria was included. The sample size is calculated using the formula  $S=4pq/l^2$  where p = prevalence of c-section deliveries in hospital over past 5 years (40%) and q = 1-p (60%) and I = allowable error (10%). Sample size =  $4 \times 40 \times 60 / 10^2 = 96$ . Thus, the final sample size of 100 is considered for the study.

Inclusion criteria: All women taken for elective LSCS in OBG department.

Exclusion criteria: 1) All women undergoing emergency LSCS, 2) All women who had already received antibiotic 1 hour before surgery for associated conditions like PROM, vaginal infections, UTI and 3) Patients were undergoing hysterotomy.

A four-step protocol was adopted:

- 1) In the first step data from all women undergoing elective CS regarding the parity, period of gestational age, the antibiotic given pre or post CS, dose of antibiotic and type of antibiotic given was collected.
- 2) During the second step, data collected was shared with the hospital staff. These professionals identified the interventions to be prioritized which included -
  1. To ensure that prophylactic antibiotic was given to pregnant women undergoing elective LSCS.
  2. To ensure that prophylactic antibiotic was given within 1 hour before skin incision.
  3. Dosage and type of antibiotic is determined based on the hospital antibiogram and standard guidelines.
  4. Accordingly, SOP (standard operating procedure) was formulated for implementing these objectives which included.

5. All pregnant women undergoing elective LSCS are given antibiotic in pre operative holding area by the in-charge sister 30–60 min before the incision.
  6. Amoxicillin – clavulonic acid 1.2 gm intravenous route to be given and in those with premature rupture of membranes injection cefotaxime 1 gm intravenous route.
  7. OT (operation theatre) sisters and operating surgeons are to ensure that the antibiotic is given within the prescribed time frame and same documented in surgical safety check list before receiving the patient into the theatre OT nurse and reported at the end of the month,
  8. Implementing a reporting system where a separate register is maintained by the nurse and reported at the end of the month.
  9. Strengthening the supply chain for antibiotics
  10. Improving operating theatre discipline and organization
- 3) In third step training was given to all consultant and junior staff and nurses regarding the SOP and its implementation through meetings and coordinated supervision.
  - 4) The last step included the post audit which included enrolling all consecutive women undergoing an elective CS for 3 months follow up period starting from Jan 2020 -March 2020 for antibiotic usage.

The data obtained was collected on Microsoft Excel and analysed using SPSS Microsoft version 21. The statistical methods used were descriptive statistics (mean, SD, frequency, percentage), Chi square test, Cramer's V, one-way ANOVA and one sample t test.

**Results**

In first audit cycle, during the study period out of the total LSCS total of 96 pregnant women underwent elective LSCS whereas in the reaudit cycle a total of 108 women underwent LSCS.

**Table 1: Patient characteristics**

Parameters	Audit (n=96)	Reaudit (n=108)
Mean age (in yrs)	26	24
Socioeconomic (SES) status	Lower SES	Lower SES
Parity		
Primi	42 (43%)	53(49.1%)
Multi	54(56.2%)	55(50.9%)
Average gestational age at CS (in weeks)	38.2	38.6

Patient characteristics are summarised in table 1. Mean age of women in the audit cycle group was 26 years whereas in the reaudit group was 24 years. In both groups most

women belonged to the lower socioeconomic status. In the first group 42(43%) were primipara.

**Table 2: Indication for CS**

Parameters	Audit (96)	Reaudit (108)
Previous LSCS	38(39.5%)	43 (39.8%)
CPD	22(22.9%)	24 (22.2%)
BREECH	9(9.3%)	10 (9.2%)
Fetal distress	12(12.5%)	12 (12.5%)
PROM	11(11.4%)	14 (12.9%)
others	4(4.1%)	6 (5.5%)

CPD – Cephalopelvic disproportion, PROM – Premature rupture of membrane

Indications for LSCS are tabulated in table 2. Most common indication for elective LSCS was previous LSCS followed (39.5 % and 39.8%) by primi with CPD (22.9% v/s 22.2%).

**Table 3: Antibiotic prophylaxis**

Categories	Audit group(n=96)	Reaudit group(n=108)	P value
Received antibiotic	37 (38.5%)	97 (89.8%)	<0.00001
Did not received antibiotic	59 (61.4%)	11(10.1%)	

**Table 4: Antibiotic prophylaxis type and duration**

Categories	Audit group (n=96) those who received antibiotics (n=37)	Reaudit group (n=108) those who received antibiotic (n=97)	P value
Within 1 hour	15 (40%)	79 (81.4%)	<0.00001
More than 1 hour	22(59.4%)	18 (18.5%)	
Inj amoxicillin - clavulonic acid/ inj cefotaxime	20 (54%)	87 (89%)	
Others	17(45.9%)	10 (10.3%)	

Details of the antibiotic usage are summarised in table 3 and 4. In the audit group prophylactic antibiotic prophylaxis was given to 37 women (38.5%) and was not given to 59 women (61.4%). In reaudit cycle group, out of 108 women of this 97 (89.8%) of women received prophylactic antibiotic before elective LSCS. Out of 37 women who received antibiotic in audit group 40% (15 cases) received antibiotic within 1 hour and 22 cases (59.4%) received more than 1 hour before procedure. Out of 97 women in reaudit group 79(81.4%) women received antibiotic within 1 hour, 18 received more than 1 hour (18.5%). The antibiotic usage in the audit group varied from amoxicillin clavulonic acid to cefoperazone sulbactam to cefotaxime which was mainly based on the operating surgeon’s preference (54% v/s 45.9%). In the reaudit group majority of the women received amoxicillin clavulonic 1.2 gm IV /Inj cefotaxime based on the policy formulated based on the antibiogram of the hospital (89% v/s 10.3%).

**Discussion**

Prophylactic antibiotic is one of the most important interventions to reduce CS related mortality. Studies have shown that even in elective LSCS it helps to reduce post-partum endometritis and wound infection<sup>10</sup>. Elective LSCS provides an ample opportunity as cases are scheduled before hand and there is sufficient time to administer antibiotic. Despite this there is varied utilisation of antibiotic. In a study by Liabsuetrakul T et al, 82% doctors prescribed antibiotics before LSCS and were more likely to prescribe if there is associated risk factor<sup>11</sup>. In study by Heineck I et al antibiotic usage was 61%<sup>12</sup>. In our study also prior to the intervention the usage of antibiotic was only 38.5%.

The timing of antibiotic prior to CS is even more varied. With some following administration of antibiotic before surgery whereas some advocating at the time of cord clamping. A study conducted by Lomanski Dalmani et al concluded that antibiotic prior to the skin incision is most beneficial and for maximum concentration it is recommended to give antibiotic within 1 hour of skin incision<sup>13</sup>. In our study only 40% received within 1 hour.

The type of antibiotic was largely dictated by the surgeon’s preference with major preference was second generation cephalosporin’s antibiotic. In a study by Liu et al ceftriaxone sulbactam was most prescribed<sup>14</sup> whereas in our study most common antibiotic prescribed was Inj amoxicillin clavulonic acid (54%).

Quality improvement measures like clinical audit is an important tool to identify deviation in the policy protocol, identify causes and to correct causes for deviation in policy. Conducting a reaudit helps to evaluate the change in behaviour and policy outcome. In our study analysis of the reasons for non-antibiotic and delayed antibiotic usage revealed myriad causes including operator’s preference, non-coordination between operating surgeons and nursing staff, and delayed availability of antibiotic. In an audit conducted by Taylor et al the major cause for infection was failure to give prophylactic antibiotics particularly at elective caesarean section. After introduction of a local protocol and reaudit increased compliance of 97%<sup>9</sup>. In a study assessing risk factors associated with no prophylaxis found that forgetting or skipping due to time constraints was an important cause for not giving antibiotic. Having a quality improvement measures including clinical audit improves the uptake of standard guidelines<sup>15</sup>.

Formulating a policy including new antibiotic policy based on local antibiogram, SOP for transfer of the patient, increasing and strengthening antibiotic supply chain helped

to increase the antibiotic usage from 38.5% to 89.8%. In majority of the women received Inj amoxicillin clavulanic 1.2 gm IV /Inj cefotaxime was used (89%) and was given within 1 hour (81.4%). Uniformity in prescribing antibiotic will help to reduce the antibiotic resistance. In a similar study by Ristić S et al antibiotic usage increased and there was a shift to using first generation cephalosporins and ampicillin after a local policy guideline was implemented<sup>16</sup>.

### Conclusion

Formulating an antibiotic policy for prophylaxis in women undergoing elective LSCS and conducting an audit and reaudit is a simple but effective tool. It will help to improve prophylactic antibiotic usage and increase uniformity. Routine clinical audit for antibiotic prophylaxis is recommended across institutions performing CS.

**Conflict of interest:** None. **Disclaimer:** Nil.

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**Sowmya K <sup>1</sup>, Suma KB <sup>2</sup>**

<sup>1</sup> Associate professor, Department of OBG, JSS medical college and hospital, Mysore, Karnataka, India; <sup>2</sup> HOD and Professor, Department of OBG, JSS medical college and hospital, Mysore, Karnataka, India.