RESEARCH PAPER

Antibiotics Prophylaxis in Caesarean Section Delivery

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ABSTRACT

Background: Cesarean section is one of the most commonly performed obstetric surgical procedures and is associated with increased risk of postoperative infectious morbidity. Antibiotic prophylaxis plays an important role in reducing postoperative infections and improving maternal outcomes. Evaluation of antibiotic utilization patterns is essential to promote rational prescribing practices and minimize antimicrobial resistance.

Aim: To study the pattern of prophylactic antibiotic usage in elective cesarean sections in an Indian tertiary care hospital setting.

Materials and Methods: A hospital-based observational study was conducted among 150 women undergoing elective cesarean section at a tertiary care hospital. Data regarding demographic profile, timing of antibiotic administration, antibiotic regimen, duration of therapy, and postoperative infectious complications were collected using a structured case record form. Statistical analysis was performed using SPSS software version 25.0. Descriptive statistics and Chi-square test were applied, and $p<0.05$ was considered statistically significant.

Results: Most patients received prophylactic antibiotics within 30–60 minutes before skin incision. The majority of women received postoperative antibiotics for less than 48 hours. Combination therapy consisting of ceftriaxone, gentamicin, and metronidazole was the most commonly prescribed regimen. Women from upper lower socioeconomic class constituted the largest proportion of the study population, and second gravida women accounted for the highest number of elective cesarean sections.

Conclusion: The study demonstrated variability in prophylactic antibiotic prescribing practices in elective cesarean section. Appropriate timing of antibiotic administration and rational antibiotic utilization are essential to reduce postoperative infectious morbidity and antimicrobial resistance. Adherence to evidence-based antibiotic prophylaxis guidelines should be encouraged in tertiary care hospitals.

Keywords: Antibiotic prophylaxis, Cesarean section, Antimicrobial usage, Surgical site infection
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INTRODUCTION

Cesarean section is one of the most commonly performed surgical procedures worldwide and has become an essential component of modern obstetric care. Over the past few decades, the rate of cesarean delivery has increased substantially in both developed and developing countries due to improved surgical safety, increased institutional deliveries, medico-legal concerns, and rising maternal and fetal indications. Although cesarean section can be life-saving for both mother and fetus, it is associated with a significantly higher risk of postoperative infectious morbidity compared with vaginal delivery [1].

Postoperative infections following cesarean section include surgical site infection, endometritis, urinary tract infection, febrile morbidity, pelvic abscess, and sepsis. These complications contribute to prolonged hospital stay, increased healthcare costs, delayed maternal recovery, and increased maternal morbidity. In low- and middle-income countries, the burden of postoperative infections remains particularly high due to limited resources, overcrowding in healthcare facilities, inadequate infection control measures, and inappropriate antibiotic practices [2].

Antibiotic prophylaxis has become a standard component of perioperative management in cesarean delivery to

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reduce postoperative infectious complications. Administration of prophylactic antibiotics before skin incision has been shown to significantly reduce the incidence of surgical site infections, postpartum endometritis, febrile illness, and wound complications. Several international guidelines recommend the use of a single dose of broad-spectrum antibiotic administered within 60 minutes before surgical incision in elective cesarean section [3].

Despite clear recommendations, the pattern of prophylactic antibiotic use varies considerably across healthcare settings, especially in developing countries including India. Variations exist in terms of timing of administration, choice of antibiotic, dosage, duration of therapy, and use of combination regimens. In many institutions, prolonged postoperative antibiotic administration continues to be practiced despite evidence supporting shorter regimens. Such irrational antibiotic use may contribute to antimicrobial resistance, increased treatment costs, adverse drug reactions, and unnecessary exposure to broad-spectrum agents [4].

The emergence of antimicrobial resistance has become a major global public health concern. Excessive and inappropriate antibiotic prescribing in surgical practice, including obstetrics, plays an important role in the development of resistant bacterial strains. Rational antibiotic prophylaxis is therefore necessary not only to prevent postoperative infections but also to minimize the development of antimicrobial resistance and preserve antibiotic effectiveness for future use [5].

Studies have demonstrated that single-dose antibiotic prophylaxis is as effective as multiple-dose regimens in preventing postoperative infectious morbidity following elective cesarean section. Single-dose therapy offers several advantages including lower cost, reduced nursing workload, decreased risk of adverse effects, and lower likelihood of resistant organism development. However, multiple-dose regimens are still commonly prescribed in many tertiary care hospitals because of institutional preferences, fear of postoperative infections, and lack of adherence to evidence-based guidelines [6].

The choice of antibiotic used for prophylaxis is another important factor influencing clinical outcomes. Cephalosporins, particularly first-generation cephalosporins such as cefazolin, are widely recommended because of their effectiveness against common skin and genital tract organisms, favorable safety profile, and low cost. In some Indian healthcare settings, combinations of cephalosporins with metronidazole or aminoglycosides are frequently prescribed to provide broader antimicrobial coverage. However, routine use of broad-spectrum combinations without clear indication may increase antimicrobial resistance and healthcare expenditure [7].

Several factors influence postoperative infectious morbidity after cesarean section including maternal anemia, obesity, diabetes mellitus, prolonged labor, premature rupture of membranes, prolonged operative duration, poor nutritional status, and inadequate aseptic precautions. Appropriate antibiotic prophylaxis acts as an important preventive strategy to reduce infection risk in these patients [8]. Evaluating antibiotic utilization patterns in tertiary care hospitals is therefore essential for identifying irrational prescribing practices and improving adherence to standard treatment guidelines.

In India, limited data are available regarding the actual pattern of prophylactic antibiotic usage in elective cesarean section and the extent of compliance with recommended guidelines. Drug utilization studies conducted in obstetric practice help in assessing prescription trends, promoting rational antibiotic use, minimizing unnecessary drug exposure, and developing institutional antibiotic stewardship policies [9].

Considering the increasing rates of cesarean section and the growing concern regarding antimicrobial resistance, evaluation of prophylactic antibiotic practices has become highly important. Therefore, the present study was undertaken to assess the pattern of prophylactic antibiotic usage in elective cesarean sections at a tertiary care hospital in an Indian setting and to evaluate prescribing trends, antibiotic selection, timing, and duration of administration [10].

MATERIALS AND METHODS

The present hospital-based observational study was conducted Ayushy Hospital, Gir Somnath, Gujarat to evaluate the pattern of prophylactic antibiotic usage in elective cesarean sections. The study was carried out over a period of one year after from October 2023 to May 2025 after obtaining approval from the Institutional Ethics Committee.

Inclusion Criteria

- The study included women scheduled for elective cesarean sections

Exclusion Criteria

- Women presenting with signs of active infection, such as fever or leukocytosis.
- Those already receiving antibiotic therapy prior to surgery.
- Patients with severe anemia or underlying medical illnesses.
- Women referred from other hospitals after labour onset.

A total sample size of 150 pregnant women undergoing elective cesarean section during the study period were included in the study. Patients admitted for planned elective lower segment cesarean section irrespective of parity and indication were enrolled after obtaining written informed consent. Women with evidence of active infection, prolonged rupture of membranes, emergency cesarean section, known hypersensitivity to antibiotics,

severe systemic illness, or immunocompromised status were excluded from the study.

Data were collected using a structured case record form containing demographic details, obstetric history, indication for cesarean section, comorbid conditions, duration of hospital stay, and details regarding antibiotic prophylaxis. Information regarding the type of antibiotic prescribed, dosage, timing of administration, route of administration, frequency, duration of therapy, use of combination antibiotics, and postoperative antibiotic continuation was recorded. Adherence to standard antibiotic prophylaxis guidelines was also assessed.

Patients were monitored during the postoperative period for occurrence of febrile morbidity, surgical site infection, wound discharge, urinary tract infection, and other postoperative infectious complications. The duration of hospitalization and postoperative recovery status were documented. The pattern of antibiotic prescribing was analyzed to identify the most commonly used antibiotic regimens and prescribing trends in elective cesarean section.

The collected data were entered into Microsoft Excel and analyzed using Statistical Package for Social Sciences (SPSS) software version 25.0. Descriptive statistics such as mean, standard deviation, frequency, and percentage were calculated. Categorical variables were analyzed using Chi-square test and continuous variables were compared using Student's t-test wherever applicable. A p-value less than 0.05 was considered statistically significant.

The study protocol was reviewed and approved by the Institutional Ethics Committee prior to commencement of the study. Written informed consent was obtained from all study participants before enrollment. Confidentiality of patient information was maintained throughout the study, and all procedures were conducted in accordance with ethical standards for biomedical research involving human participants.

RESULTS

Table 1 shows the demographic and clinical characteristics of the study participants undergoing elective cesarean section. The mean age of the patients was 24.84±3.14 years. Most of the participants belonged to the upper lower socioeconomic class accounting for 63 (42.0%) patients, followed by the lower socioeconomic class with 38 (25.3%) patients. Upper middle and upper socioeconomic groups constituted smaller proportions of the study population. Regarding parity distribution, second gravida women formed the largest group with 61 (40.7%) patients, followed by primigravida women comprising 52 (34.7%) participants. Third gravida and greater than third gravida women accounted for 29 (19.3%) and 8 (5.3%) patients respectively.

Table 2 demonstrates the pattern of prophylactic antibiotic usage among women undergoing elective cesarean section. The majority of patients, 109 (72.7%), received prophylactic antibiotics within 30–60 minutes before skin incision, whereas 41 (27.3%) patients received antibiotics more than 60 minutes before surgery. Regarding duration of postoperative antibiotic administration, most patients received antibiotics for less than 48 hours accounting for 117 (78.0%) cases. Antibiotic administration for 48–72 hours and more than 72 hours was observed in 21 (14.0%) and 12 (8.0%) patients respectively. Combination antibiotic regimen consisting of ceftriaxone, gentamicin, and metronidazole was the most commonly prescribed regimen and was used in 129 (86.0%) patients, whereas the alternative regimen containing ampicillin, gentamicin, and metronidazole was prescribed in 21 (14.0%) patients.

Postoperative infectious morbidity was low among the study participants. Wound sepsis was observed in 6 (4.0%) patients, while postoperative febrile morbidity was noted in 9 (6.0%) patients during the hospital stay. Most cases responded well to conservative management and appropriate antibiotic therapy. (Table 3 and Graph 1)

Table 1: Demographic and clinical characteristics of the study population

Characteristics	Study Group (n=150)
Age (years) Mean±SD	24.84±3.14
Socioeconomic class	
Lower	38 (25.3%)
Upper lower	63 (42.0%)
Lower middle	27 (18.0%)
Upper middle	17 (11.3%)
Upper	5 (3.3%)
Parity	
Primigravida	52 (34.7%)
2nd gravida	61 (40.7%)
3rd gravida	29 (19.3%)
>3rd gravida	8 (5.3%)

Table 2: Pattern of prophylactic antibiotic usage

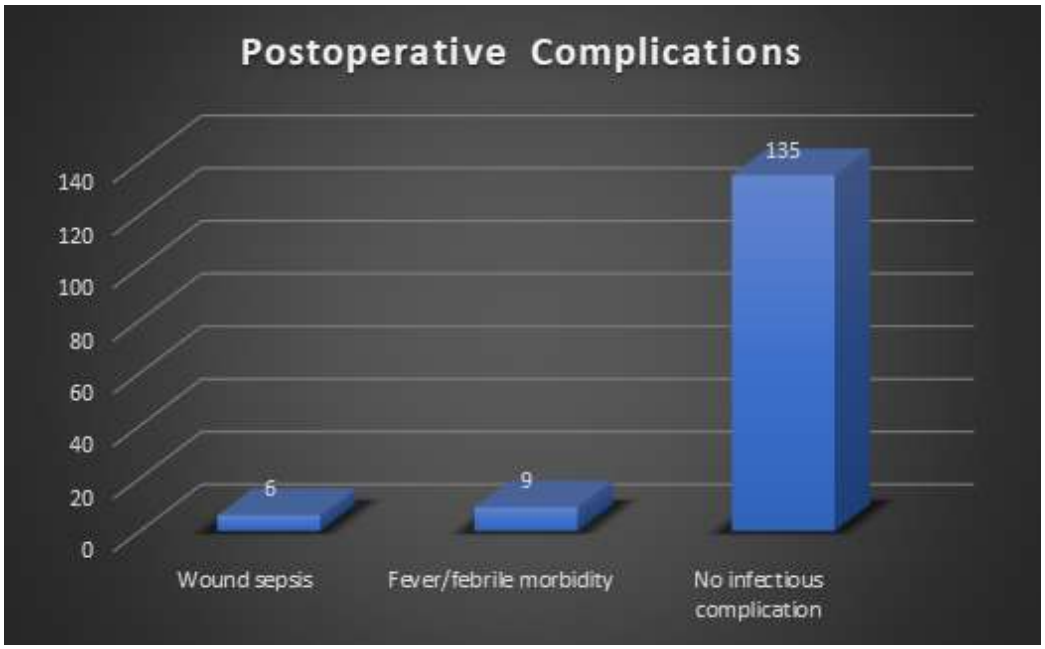
Parameters	Study Group (n=150)
Timing of prophylactic antibiotic	
Within 30–60 mins before skin incision	109 (72.7%)
More than 60 mins before skin incision	41 (27.3%)

Duration of antibiotic usage in post-operative period	
Less than 48 hours	117 (78.0%)
48–72 hours	21 (14.0%)
More than 72 hours	12 (8.0%)
Combination of antibiotics used	
Regimen 1	
Injection ceftriaxone 1 g IV BD	
Injection gentamycin 80 mg IV BD	
Injection metronidazole 100 cc IV TDS	129 (86.0%)
Regimen 2	
Injection ampicillin 500 mg IV QID	
Injection gentamycin 80 mg IV BD	
Injection metronidazole 100 cc IV TDS	21 (14.0%)

Table 3: Postoperative Complications

Postoperative complications	Number	Percentages (%)
Wound sepsis	**6**	**4**
Fever/febrile morbidity	**9**	**6**
No infectious complication	**135**	**90**

Graph 1



DISCUSSION

The present study was conducted to evaluate the pattern of prophylactic antibiotic usage in elective cesarean sections at a tertiary care hospital. The findings demonstrated that the majority of women received prophylactic antibiotics within 30–60 minutes before skin incision, which is in accordance with recommended perioperative antibiotic guidelines. Most patients received postoperative antibiotics for less than 48 hours, while combination antibiotic therapy consisting of ceftriaxone, gentamicin, and metronidazole was the most commonly prescribed regimen. The study also revealed that the majority of women belonged to the upper lower socioeconomic class and that second gravida women formed the largest proportion of the study population.

Appropriate timing of prophylactic antibiotic administration is considered essential for achieving adequate tissue drug concentration during surgery and reducing postoperative infectious morbidity. In the present study, 72.7% of patients received antibiotics within 30–60 minutes prior to skin incision. Similar observations were reported by Owens et al., who concluded that administration of prophylactic antibiotics within one hour before surgical incision significantly reduces postoperative wound infection and febrile morbidity in cesarean deliveries [11]. Timely antibiotic administration ensures effective antimicrobial coverage during the period of maximal bacterial exposure and is therefore considered an important component of surgical infection prevention protocols.

The present study observed that the majority of patients received postoperative antibiotics for less than 48 hours. Current evidence supports the use of shorter antibiotic regimens in uncomplicated elective cesarean sections because prolonged administration offers limited additional benefit and may contribute to antimicrobial resistance. Sullivan et al. reported that single-dose or short-duration prophylactic antibiotic regimens are equally effective compared with prolonged multidose regimens in preventing postoperative infectious complications following cesarean delivery [12]. Reduced antibiotic exposure may also decrease treatment cost, adverse drug reactions, and the emergence of resistant bacterial strains.

Combination antibiotic therapy was widely prescribed in the present study, with ceftriaxone, gentamicin, and metronidazole being the most commonly used regimen. Combination therapy is frequently preferred in tertiary care settings because it provides broader antimicrobial coverage against gram-positive, gram-negative, and anaerobic organisms commonly associated with postoperative infections. Similar prescribing trends were reported by Thakur et al., who observed extensive use of cephalosporin-based multidrug regimens in obstetric surgeries across Indian tertiary hospitals [13]. However, the authors emphasized that irrational use of broad-spectrum combinations without proper indication may contribute to increased antimicrobial resistance and healthcare expenditure.

The demographic profile of the present study revealed that most women belonged to lower and upper lower socioeconomic groups. Socioeconomic status may influence nutritional condition, hygiene practices, access to healthcare services, and risk of postoperative infection. Women from lower socioeconomic backgrounds may have increased susceptibility to postoperative morbidity due to anemia, inadequate antenatal care, and poor living conditions. Sharma et al. reported that socioeconomic factors significantly influence maternal health outcomes and postoperative recovery following cesarean section in resource-limited settings [14]. Therefore, rational antibiotic prophylaxis becomes particularly important in such populations to minimize infectious complications and improve maternal outcomes.

The findings of the present study also demonstrated that second gravida women constituted the largest proportion of cesarean deliveries. Increased parity and previous obstetric history are recognized factors influencing the likelihood of cesarean section. Proper antibiotic prophylaxis in repeat cesarean deliveries is especially important because repeated surgical procedures may increase the risk of postoperative infection and adhesions. According to Lamont et al., adherence to evidence-based antibiotic prophylaxis protocols significantly reduces postoperative infectious morbidity irrespective of parity status or previous cesarean history [15].

The incidence of postoperative wound sepsis and febrile morbidity in the present study was relatively low, which may be attributed to timely administration of prophylactic antibiotics and adherence to aseptic surgical practices. Similar findings have been reported in previous studies evaluating prophylactic antibiotic use in elective cesarean section

The present study highlights the importance of evaluating antibiotic prescribing patterns in obstetric practice to promote rational drug use and improve adherence to standard treatment guidelines. Monitoring prophylactic antibiotic practices may help reduce unnecessary antibiotic exposure and support antimicrobial stewardship efforts in tertiary care hospitals. However, the study was limited to a single-center setting and did not include long-term postoperative follow-up or microbiological assessment of infections. Further multicentric studies are recommended to evaluate the effectiveness of various prophylactic antibiotic regimens and their impact on antimicrobial resistance patterns.

CONCLUSION

The present study demonstrated that prophylactic antibiotics were commonly administered within the recommended preoperative period of 30–60 minutes before elective cesarean section. Most patients received postoperative antibiotics for less than 48 hours, and combination antibiotic therapy consisting of ceftriaxone, gentamicin, and metronidazole was the most frequently prescribed regimen. The findings indicate considerable variation in antibiotic prescribing practices in elective cesarean section. Rational antibiotic utilization and adherence to evidence-based guidelines are essential to reduce postoperative infections, minimize antimicrobial resistance, and improve maternal healthcare outcomes. The low incidence of postoperative wound sepsis and febrile morbidity observed in the present study further supports the importance of appropriate prophylactic antibiotic administration in elective cesarean section

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