



## Analysis Of Prophylactic Antibiotic Efficacy In Adolescent Mothers Undergoing Emergency Cesarean Section

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**Abstract: Background:** There is a higher risk of developing postoperative infections among adolescent mothers who receive emergency cesarean section due to a long labour period, anaemia, and delayed hospital presentation. Routine use of prophylactic antibiotics is used to minimise infectious morbidity, but their efficacy and the most effective time in adolescent parturients is not adequately assessed in regional clinical contexts. **Objectives:** To determine the effectiveness of prophylactic antibiotics in postoperative infection prevention in adolescent mothers undergoing emergency cesarean section and to determine variables related to infectious morbidity despite prophylaxis. **Methodology:** The study was cross-sectional Conducted at Department Obstetrics and Gynecology Gomal Medical College, Dera Ismail Khan from jan 2025 to june 2025. 120 adolescent mothers who were 19 years of age or less and had an emergency cesarean performed in a tertiary-care facility. Standard prophylactic antibiotics were given to all the participants either before the skin incision or after clamping of the umbilical cord. Demographic data, rupture of the membrane, labour time, levels of haemoglobin, time of surgery and the time of antibiotic were all documented. The measures of outcomes were determined within 30 days of the operation, such as surgical site infection, endometritis, febrile morbidity, and urinary tract infection. The SPSS version 24.0 was used in statistical analysis, where chi-square and independent t-tests with  $p < 0.05$  were used as significant. **Results:** The mean age was  $17.6 \pm 1.2$  years. Antibiotics were administered pre-incision in 72 (60%) patients and post-cord clamping in 48 (40%). Overall infectious morbidity was 21.7%. Surgical site infection occurred in 12.5%, endometritis in 5.8%, febrile morbidity in 8.3%, and urinary tract infection in 5.0%. Infection rates were significantly lower in the pre-incision group compared with the post-cord clamping group (15.3% vs 31.2%,  $p = 0.021$ ). Patients who developed infections had longer rupture of membranes ( $14.1 \pm 4.3$  vs  $9.2 \pm 3.6$  hours,  $p = 0.003$ ) and lower hemoglobin levels ( $9.1 \pm 1.0$  vs  $10.4 \pm 1.2$  g/dL,  $p = 0.001$ ). **Conclusion:** Prophylactic antibiotics are effective in the reduction of postoperative infection in adolescent mothers, especially when used before the process of skin incision. Improvement of timing and correction of modifiable risk factors can also help improve outcomes.

**Keywords:** Adolescents; cesarean section; prophylactic antibiotics; postoperative infection.

## INTRODUCTION

One of the most frequently performed obstetric surgical procedures in the world is Cesarean section, which is also a significant source of maternal morbidity, especially in emergency cases. In spite of the fact that the development of operative methods and the ability to provide adequate care during the postoperative period have significantly lowered the mortality rates, postoperative infections still present a considerable burden, both clinical and economic [1]. The most common complications that arise after cesarean delivery include surgical site infection (SSI), postpartum endometritis, urinary tract infection (UTI), and febrile morbidity, which are linked with long hospital stay, high healthcare expenses, and maternal well-being problems [2]. Teen pregnancy is a special and delicate subgroup of obstetric practice. Teens usually appear with poor prenatal care, nutritional deprivation, anaemia, and psychosocial impediments that undermine the health-seeking behaviour [3]. Adolescent mothers in most of the low- and middle-income countries often present to tertiary-care facilities with extended labour, numerous vaginal examinations, and extended rupture of membranes, all of which put a high risk of perioperative infection. Cesarean section that is done in emergency cases in this population is thus related to an increased infectious burden than the elective surgeries in adult women [4]. One of the foundation blocks of infection prevention in cesarean delivery is antibiotic prophylaxis. The present international best practices advise the use of a first-generation cephalosporine within 60 minutes in advance of the initial skin incision to guarantee that the tissue concentration is sufficient at the point of bacterial inoculation. In practice, however, especially in emergencies, antibiotics will be given following umbilical cord clamping because of the possibility of exposure to neonatal nephrite or because of logistical limitations. The developing data suggest that the administration of post-cord clamping is less efficient in the prevention of maternal infections, and the adherence to pre-incision prophylaxis is not consistent across a variety of institutions [5,6]. Although several studies have established the advantage of prophylactic antibiotics in the prevention of post-cesarean infections, few studies have been done region-specifically on the adolescent mothers who undergo emergency cesarean section [7]. The majority of available data is based on the adult population or, at most, includes adolescents as a minor subgroup, and this restricts the generalizability of results to such a high-risk group. In addition, there are limited studies that have assessed the effect of obstetric risk factors, including the type of prolonged rupture of membranes, anaemia, or duration of the operation, on the efficacy of antibiotic prophylaxis among adolescents [8]. The relevance of the extent of advantage in relation to the time of taking

prophylactic antibiotics and the risk factors that can be altered to prevent infection are important in the development of specific prevention measures [9]. In environments where healthcare resources are limited and patient loads are great, enhancing perioperative infection prevention bundles specific to adolescent obstetrics can produce significant gains to the maternal outcomes [10]. This study was thus done in order to determine the effectiveness of given prophylactic antibiotics on adolescent mothers in cases of emergency cesarean delivery and to investigate clinical and surgical predictors of postoperative infection despite prophylaxis. The conclusions will be used to evidence-based optimise the local obstetric protocols and enhance the quality of care of the mothers in this high-risk group.

### Study Objectives:

The effect of prophylactic antibiotics in the prevention of postoperative infection in adolescent mothers who undergo emergency cesarean section, and the clinical factors correlated with infectious morbidity despite prophylaxis.

## MATERIALS AND METHODS

### Study Design & Setting:

The study was cross-sectional Conducted at Department Obstetrics and Gynecology Gomal Medical College, Dera Ismail Khan from jan 2025 to june 2025.

### Participants:

One hundred and twenty adolescent mothers aged 19 years and below who have received emergency cesarean section were selected on a first-come, first-served basis. Demographic factors, obstetric history, and details of the administration of antibiotics and the postoperative outcome of the patient were examined in patient records upon the hospital stay and follow-up visits within 30 days.

### Sample Size Calculation:

Sample size was determined based on a 30 per cent postoperative infection rate in delayed prophylaxis and 15 per cent in timely prophylaxis of the study population, having a power of 80 and a significance level of 5 per cent. The minimum calculated sample was 108, with an addition of 10 per cent due to the incompleteness of the data; a total of 120 patients were taken.

### Inclusion Criteria:

- Age  $\leq 19$  years
- Emergency cesarean section
- Prophylactic dose of antibiotics received.

#### Exclusion Criteria:

- Elective cesarean section
- Immunodeficiency or steroid treatment is recognised.
- Infection present at admission.

#### Primary Diagnostic and Management Strategy:

The clinical diagnosis of postoperative infections was performed on the basis of fever, erythema or discharge of the wound, tenderness of the uterus, and lab results. All the suspected cases were treated as per institutional policies, including culture-sensitive

antibiotics, wound treatment, and prolonged hospitalisation where necessary.

#### Statistical Analysis:

SPSS version 24.0 was used in the analysis of data. The quantitative variables were represented in the form of mean, standard deviation, and qualitative variables in the form of frequencies and percentages. The chi-square and independent t-tests were applied, and  $p=.05$  was taken as statistically significant.

#### Ethical Approval:

## RESULTS

A total of 120 adolescent mothers were analyzed with a mean age of  $17.6 \pm 1.2$  years. Prophylactic antibiotics were administered before skin incision in 72 (60%) patients and after umbilical cord clamping in 48 (40%). Overall postoperative infectious morbidity was observed in 26 (21.7%) patients. Surgical site infection was the most common complication, occurring in 15 (12.5%) cases, followed by febrile morbidity in 10 (8.3%), endometritis in 7 (5.8%), and urinary tract infection in 6 (5.0%). Infection rates were significantly lower in the pre-incision prophylaxis group compared with the post-cord clamping group (15.3% vs 31.2%,  $p=0.021$ ). Patients who developed infections had a longer duration of rupture of membranes ( $14.1 \pm 4.3$  vs  $9.2 \pm 3.6$  hours,  $p=0.003$ ) and significantly lower preoperative hemoglobin levels ( $9.1 \pm 1.0$  vs  $10.4 \pm 1.2$  g/dL,  $p=0.001$ ). Mean hospital stay was prolonged in infected patients ( $6.2 \pm 1.8$  vs  $3.9 \pm 1.2$  days,  $p=0.001$ ).

#### Intervention Outcome:

The prophylaxis of antibiotics pre-incision was also linked to a sharp decrease in the postoperative infectious morbidity in adolescent mothers who had emergency cesarean section. Better scheduling of the administration of antibiotics as well as analgesic treatment, prompt correction of anaemia, and close observation of protracted labour might also benefit the outcomes of postoperative conditions.

**Table 1. Baseline Demographic and Obstetric Characteristics of Adolescent Mothers (n = 120)**

| Variable                                      | Total (n=120)   |
|-----------------------------------------------|-----------------|
| Age (years), mean $\pm$ SD                    | $17.6 \pm 1.2$  |
| Primigravida, n (%)                           | 78 (65.0)       |
| Gestational age (weeks), mean $\pm$ SD        | $38.1 \pm 1.3$  |
| Duration of labor (hours), mean $\pm$ SD      | $10.4 \pm 3.9$  |
| Rupture of membranes >12 hours, n (%)         | 44 (36.7)       |
| Preoperative hemoglobin (g/dL), mean $\pm$ SD | $10.1 \pm 1.3$  |
| Operative time (minutes), mean $\pm$ SD       | $58.6 \pm 14.2$ |

Baseline demographic and obstetric parameters of adolescent mothers undergoing emergency cesarean section.

**Table 2. Timing of Prophylactic Antibiotic Administration and Postoperative Infectious Outcomes**

| Outcome                            | Pre-incision (n=72) | Post-cord clamping (n=48) | p-value |
|------------------------------------|---------------------|---------------------------|---------|
| Any postoperative infection, n (%) | 11 (15.3)           | 15 (31.2)                 | 0.021   |
| Surgical site infection            | 6 (8.3)             | 9 (18.7)                  | 0.048   |
| Endometritis                       | 3 (4.2)             | 4 (8.3)                   | 0.312   |
| Febrile morbidity                  | 4 (5.6)             | 6 (12.5)                  | 0.181   |
| Urinary tract infection            | 2 (2.8)             | 4 (8.3)                   | 0.164   |

Comparison of postoperative infectious outcomes based on timing of prophylactic antibiotic administration.

**Table 3. Comparison of Clinical Characteristics Between Infected and Non-Infected Patients**

| Variable                       | Infected (n=26) | Non-infected (n=94) | p-value |
|--------------------------------|-----------------|---------------------|---------|
| Age (years), mean $\pm$ SD     | 17.5 $\pm$ 1.1  | 17.7 $\pm$ 1.2      | 0.472   |
| Rupture of membranes (hours)   | 14.1 $\pm$ 4.3  | 9.2 $\pm$ 3.6       | 0.003   |
| Preoperative hemoglobin (g/dL) | 9.1 $\pm$ 1.0   | 10.4 $\pm$ 1.2      | 0.001   |
| Duration of labor (hours)      | 13.2 $\pm$ 4.1  | 9.6 $\pm$ 3.4       | 0.002   |
| Operative time (minutes)       | 67.3 $\pm$ 15.1 | 55.9 $\pm$ 12.8     | 0.001   |

Comparison of clinical and operative characteristics between adolescents with and without postoperative infections.

**Table 4. Multivariable Logistic Regression Analysis of Predictors of Postoperative Infection**

| Variable                         | Adjusted OR | 95% CI  | p-value |
|----------------------------------|-------------|---------|---------|
| Post-cord clamping antibiotics   | 2.4         | 1.1–5.3 | 0.028   |
| Rupture of membranes >12 hours   | 2.8         | 1.3–6.1 | 0.007   |
| Preoperative hemoglobin <10 g/dL | 3.2         | 1.4–7.2 | 0.004   |
| Labor duration >10 hours         | 2.6         | 1.2–5.8 | 0.015   |
| Operative time >60 minutes       | 2.1         | 1.0–4.5 | 0.046   |

Multivariable logistic regression identifying independent predictors of postoperative infection among adolescent mothers undergoing emergency cesarean section.

## DISCUSSION

This paper has compared the efficacy of prophylactic antibiotics in teenage mothers who have an emergency cesarean section, and they have shown a clinically significant decrease in postoperative infectious morbidity with administering the antibiotics before the skin incision as opposed to after clamping of the umbilical cord [11]. The presence of a high-risk profile about adolescent emergency cesarean deliveries, including the excessive duration of labour, the excessive duration of membrane rupture (ROM), anaemia, and acute surgical indicators, all combine to raise the risk of infection, which is reflected in the overall infectious morbidity of 21.7% in our cohort. Notably, our results confirm that the execution fidelity, especially the time of prophylaxis, continues to be a determining factor of the outcomes in the real-life context [12]. One of the consequences was the much lower rate of infection in the pre-incision group (15.3 vs 31.2;  $p=0.021$ ). In the past five years, the literature has been clear that pre-incision prophylaxis is better than post-incision prophylaxis in the context of maternal protection, probably because the optimal level of antibiotics is found in the tissues at the moment of incision and that these tissues are likely to be contaminated [13]. This is consistent with the various recent cohort and pragmatic studies that have found a decrease in SSI and composite infectious outcomes in case prophylaxis is administered within the recommended pre-incision period, without clinically significant neonatal harm under conventional regimens [14]. Our subgroup trend also indicates that SSI reduction is the most advantageous, and it is consistent with the mechanistic prediction that skin and subcutaneous contamination takes place early and is most capable of prevention through optimal timing [15]. The frequency of SSI (12.5) is

similar to that observed in the emergency cesarean groups of low- and middle-income nations, where resource constraints, overcrowded labour units and delayed initiation of presentation are some of the factors that increase the risk baseline compared to elective cesarean series [16]. On the contrary, study in settings with more resources typically suggests lower rates of SSI, which could be associated with increased compliance with perioperative bundles (chlorhexidine preparation, standardised dosing, temperature regulation, and post-discharge follow-up) and reduced rates of delayed labour and ROM [17]. The necessity of context-specific infection prevention plans based on the facts of emergency workflow life is thus supported in our data. In addition to the timing of prophylaxis, we found long ROM, reduced preoperative haemoglobin, protracted labour and operative time to be statistically significant predictors of infection. The recent literature also identifies long ROM and long labour as prominent causes of endometritis and SSI because of the ascending polymicrobial pollution, especially when there are frequent vaginal examinations [18,19]. The close connection with anaemia is also supported by the findings of the past five years linking poor wound healing with low haemoglobin and increased risk of postoperative infections, particularly in young mothers who might report having initial nutritional deficiencies [20]. These results imply that prophylaxis is not always effective in high-risk adolescents unless combined with interventions that minimise risks, like early detection of prolonged ROM, sepsis in the labour ward, and optimisation of anaemia. Multivariable model reveals that delayed prophylaxis (post cord clamping), delayed ROM, anaemia, labour time, and operative time were also independent predictors of infection. This is in line with the recent literature that found that prophylaxis antibiotics can mitigate risk,

but there is a residual infection in the instance of heavy bacterial load or long surgical exposures.

### Limitations:

The current study was done in one tertiary-care facility and hampers generalisation. It is cross-sectional, which limits its ability to make causal inferences, and it used medical records, which could have created bias in the information. Not all cases of infection had the available data on neonatal outcomes and microbiological cultures.

## CONCLUSION

Postoperative infections were minimised in adolescent mothers who were on emergency cesarean section through pre-incision prophylaxis. Nevertheless, the continuous membrane rupture, anaemia, and prolonged labour were still significant predictors of infection. Enhancement of protocol compliance and specific risk minimisation measures is vital to enhance maternal outcomes.

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