
FREQUENCY OF WOUND INFECTION AND ITS COMMON BACTERIA AND ANTIBIOTIC SENSITIVITY IN PATIENTS AFTER EMERGENCY CESAREAN SECTION

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ABSTRACT

Objective: To find out the prevalence of wound infection among patients who experienced the emergency cesarean section and common causative bacteria and pattern of susceptibility to antibiotics.

Study Design and Setting: A cross-sectional study within the framework of a descriptive longitudinal research design at the Department of Gynecology and Obstetrics, District Headquarter Hospital (DHQ), Mirpur, Azad Jammu and Kashmir (AJK) from June 2025 to September 2025.

Methodology: 180 women aged between 15-45 years and having an emergency cesarean section were enrolled in the study by use of a consecutive sampling method. The patients who had the risk factors risk factors to be infected like diabetes, malignancy, greater than 29kg/m² and recent steroid or antibiotic administration were ruled out. The participants were all observed after seven days after surgery to identify any indication of wound infection, which was considered to be the presence of pain, swelling, redness, and purulent discharge. Wound swabs were taken in case of infection and microbiological culture and sensitivity against a set of commonly used antibiotics, such as ceftriaxone, amoxicillin, gentamicin, and levofloxacin. The SPSS version 10.0 was used to analyze the data.

Results: The most important conclusion was the rate of wound infection. Further examination found the abundance of certain microorganisms such as staphylococcus aureus, enterococcus faecalis, pseudomonas and E. coli. The sensitivity and resistance patterns of these isolates were recorded as regards to their sensitivity to antibiotics. Data stratification was done in terms of age, parity, and BMI to determine modification of effects.

Conclusion: The study presents important data on the local bacteria profile of post-emergency cesarean wound infections. The results will be used to inform the formulation of evidence-based guidelines on the empirical use of antibiotics and reduce patient morbidity and can be used to inform surgical prophylaxis plans.

Keywords: Antibiotic Sensitivity Testing, Cesarean Section, Emergency Medical Services, Microbiology, Surgical Wound Infection.

INTRODUCTION

A surgical delivery in which a surgeon makes one or more cuts through the abdomen of a mother (laparotomy) and the uterus to deliver one or multiple babies, or, in rare cases, to remove an unborn fetus is called a Cesarean section.¹ A lower uterine segment section is the most commonly used form of Caesarean section today; this is a transverse cut above the edge of a bladder that causes less blood loss and is less complex to repair.³ An emergency Caesarean section is a Caesarean section performed after labour has

The rates of caesarean section (CS) reached a point of 21.1 in 2010-2018 and are expected to grow to 28.5 in 2030 worldwide and contribute to 38 million cases annually. The difference in rates is so high with 5 per cent in Sub-Saharan Africa to 42.8 per cent in Latin America and the Caribbean and estimated to rise to a future value of 63.4 per cent in eastern Asia. Cesarean section is currently the most frequently conducted major operation procedure with 31 percent of the births including c/s, or 1.33 million procedures/year, potentially reaching 50 percent(or two million cesarean section yearly) by 2020. ⁶ A single most significant risk factor related to postpartum infection is cesarean

section, which is associated with a five to twenty fold increased risk of infection relative to vaginal section. 7 Wound infection is half as likely with elective cesarean section as with emergency cesarean section.8 The There are various microorganisms that cause post-cesarean section (C/S) wound infection, although the most common organism identified is that of *Staphylococcus aureus*. It is the most widespread normal skin Flora.17 Among the *S.aureus* isolates, most of them are extremely sensitive to amikacin (72.7%) and imipenem (72.7%). Others were low to moderate sensitive to a number of antibiotics such as ceftriaxone (13.6%), cefoxitin (13.6%), cefuroxime (18.1%), levofloxacin (31.8%) and erythromycin (40.9%). *S. aureus* isolates were resistant to various antimicrobial agents; majority of the *S. aureus* isolates are highly resistant to amoxicillin/clavulanate (100%) and meropenem (100%). Numerous researches are carried out to identify the appropriate regimen that spans all these organisms causing post-caesarean infectious morbidities, and none of the researches have reported the outcome that favors certain antibiotics. The Workshop of the Surgical Infection Prevention Guideline recommended that, the antimicrobials should be given 60 minutes prior to surgery and that they be discontinued within 24 hours after the surgery was completed.19 The overall purpose of using the prophylactic antibiotics in cesarean section is to decrease the morbidity and mortality after the surgeries.20 The most common combination used was between cefotaxime and metronidazole.21 The objective of the current study is to determine the frequency of wound infection and Common bacteria and their antibiotic sensitivities in patients with emergency cesarean section wound infections. Emergency cesarean section is a commonly performed procedure in our population, and wound infections after emergency cesarean section lead to an extra financial burden on the patients. Therefore, we designed this study to determine the frequency of wound infections after emergency cesarean sections, along with the common bacteria and their antibiotic sensitivities. This study will help us determine the local trend of common bacteria, and the results will be used to devise recommendations for empirical antibiotic use in wound infections after emergency cesarean sections, which will help reduce the morbidity associated with wound infections. Furthermore, the frequency of wound infection, if found to be significant in our study, will also guide us in devising certain recommendations regarding prophylactic antibiotics, which will help reduce the rate of wound infection.

METHODOLOGY

For the research to be able to explore the development of wound infections, accompanied by the analysis of the causative microorganisms and their sensitivity to antibiotics in the scenario of emergency Caesarean surgical procedures, a cross-sectional study design was used. The study was conducted in the Department of Gynecology and Obstetrics in the DHQ Hospital in Mirpur from June 2025 to September 2025. This is one of the largest hospitals in the province of Azad Jammu Kashmir.

Before the start of patient recruitment, the study protocol was vetted by, and approval obtained from, the hospital ethics committee. The study adhered to the code of medical ethics. All patients were explained, in detail, the aims, methods, benefits, as well as risks, of the study. It was also made known to them that participation was voluntary, that they were free to withdraw from the study at all times, without impact on health care, which continued unaffected. Informed consent was sought from all interested patients. Confidentiality was maintained by anonymizing all patient data documented in the study proformas, as well as assigning them codes for data analysis.

The sample size was determined using the WHO sample size calculator. With a proportion of wound infections of 7.9% following cesarean sections in previous literature, a confidence level of 95% confidence, and an absolute precision of 3.95%, the sample size was estimated to be 180 participants. The sampling technique was non-probability consecutive sampling. This was a process where all the potential participants in the study reported to the hospital during the period of the study, and the sampling was continued until the target sample size was achieved. This was the most appropriate sampling method to utilize given the busy nature of the hospital. This sampling method allowed the researcher to get a representative sample of participants in the hospital during a given period.

The study population consisted of all women undergoing emergency cesarean sections at the facility. The inclusion criteria was based on the following, All women undergoing an emergency cesarean section, regardless of the specific indication (e.g., contracted pelvis, malpresentation, failure to progress for more than 12 hours, fetal distress, antepartum hemorrhage, or obstructed labor). Patients within the reproductive age group of 15 to 45 years. Women of any gravidity and parity.

The criteria that the study used to exclude patients include conditions that might predispose the subjects to surgeries that may end up producing surgical site infections and which the study wanted to avoid. These are conditions such as diabetes mellitus and malignancies that have the potential to influence the healing of the wound or the immunity of the subjects. The conditions are identified through history taking. A history of steroid use or antibiotic administration within the week prior to the surgery. Patients with a Body Mass Index (BMI) of >29 kg/m², as obesity is a significant independent risk factor for wound infections. Other conditions that could affect infection risk, including malnutrition, post-operative anemia, the presence of a surgical drain, hypothermia, skin diseases at the operation site, chronic inflammatory conditions, or known staphylococcus carrier status. All elective cesarean section cases were excluded to focus specifically on the higher-risk emergency cohort.

The subjects were selected from the Outpatient Department of the hospital, commonly known as OPD, or they were selected from the Emergency Department, commonly known as ER. After selecting candidates on the basis of inclusion criteria, consent was taken. The candidates were also studied by doing a history and examination.

In order to standardize the procedures and eradicate the variations, which might tend to cause variations in the rates of infections, the emergency cesarean deliveries of the candidates were conducted by only one consultant gynecologist, who was a fellow of the College of Physicians and Surgeons Pakistan, having extensive expertise in the field. After the procedures, every patient was admitted to the ward and observed on a daily basis for a period of seven days. The basic outcome, which was the wound infections, was measured using the operational definition, which emphasized the presence of the following symptoms on the seventh post-operative day: pain scoring more than 1 on the Visual Analogue Scale, swelling around the area of the wound, erythema, and the discharge of the pus material.

For every patient diagnosed with a wound infection, a specimen of the purulent discharge was collected under strict aseptic conditions. The sterile swab was immediately sent to the hospital's microbiology laboratory for processing to prevent contamination or degradation of the sample.

The specimens underwent cultures in the laboratory to determine the causative bacterial organisms. The targeted bacteria were Staphylococcus Aureus, Enterococcus faecalis, Pseudomonas, and E. coli based on the standard microbiological procedures, including morphology of colonies on particular media, i.e., golden yellow colonies on mannitol-salt agar in the case of Staphylococcus Aureus; Gram staining; and biochemical tests. The laboratory operations were all done under the supervision of the same consultant microbiologist to achieve uniformity and accuracy of work.

The Kirby-Bauer disk diffusion method was used to identify the susceptibility of an organism to a panel of routinely used antibiotics once it was isolated and identified. The antibiotics put through test included cephradine, ceftriaxone, cefixime, amoxicillin, gentamicin, metronidazole, levofloxacin and tazobactam. A zone of 14 mm or above was considered to be sensitive and a zone of less than 14 mm was considered to be resistant.

The entire data obtained were recorded in a proforma that had been developed and later entered into SPSS version 10.0 to be analyzed. Age, gravidity and parity are quantitative variables that were characterized using the means and the standard deviation (SD). The categorical variables that were summarized using frequencies and percentages were frequency of wound infection, type of bacteria isolated and patterns of antibiotic sensitivity. The data of wound infection stratified age, gestational age, gravida, parity and BMI to determine whether there were effects modifiers. Chi-Square is the test that had been used following the stratification; a p-value of less than 0.05 was considered as significant. Lastly the conclusion was taken and the results were summarized in the form of tables and graphs to interpret them appropriately.

RESULTS

This study enrolled 180 patients who did emergency cesarean sections. The seven-day follow-up was carried out by all the participants.

The age of the participants used in the study was 28.4 +5.2 years, and the age of the subjects used was 18-43 years. The average gravidity was 2.8 (1.5) and the average parity was 1.7(1.3). Table 1 provides the demographic and base clinical characteristics of the study population.

Table 1: Demographic and Clinical Characteristics of Study Participants (N=180)	Column 1	Column 2
Characteristic	Mean ± SD	Range
Age (years)	28.4 ± 5.2	18 – 43
Gravidity	2.8 ± 1.5	1 – 7
Parity	1.7 ± 1.3	0 – 6
Gestational Age (weeks)	38.6 ± 1.8	35 – 41
BMI (kg/m²)	25.1 ± 2.4	19.5 – 28.9

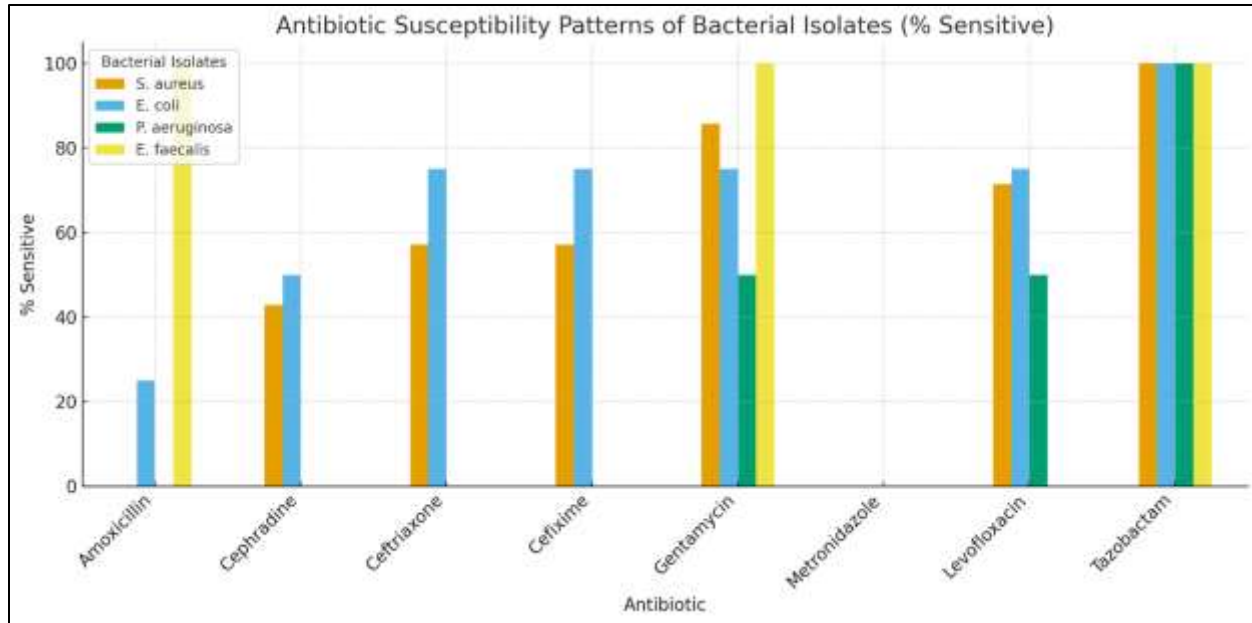
Frequency of Wound Infection of the 180 patients, 15 of them had a surgical site wound infection and the frequency was thus 8.3. The presence of pain, swelling, redness, and purulent discharge was the reason to suggest the diagnosis on the seventh post-operative day.

All 15 infected wounds had their pus cultures and sensitivity performed. The bacteria were found in 14 out of 15 samples (93.3%). One of the samples did not grow at all. The most commonly isolated microorganism was the *Staphylococcus aureus* detected in almost half of the positive cultures. Table 2 contains the distribution of the isolated bacteria.

Table 2: Frequency of Isolated Microorganisms from Infected Wounds (n=15)	Column 1	Column 2
Microorganism	Frequency (n)	Percentage (%)
<i>Staphylococcus aureus</i>	7	46.70%
<i>Escherichia coli</i> (E. coli)	4	26.70%
<i>Pseudomonas aeruginosa</i>	2	13.30%
<i>Enterococcus faecalis</i>	1	6.70%
No Growth	1	6.70%
Total	15	100%

The resistance of 14 positive bacterial isolates to antibiotics was identified. The amoxicillin-resistant isolates (100% resistant) had a good sensitivity to gentamicin and tazobactam. The most susceptible to tazobactam were Gram-negative *E. coli* and *P. aeruginosa*. *P. aureginosa* was highly resistant to most of the cephalosporins used. Table 3 contains the detailed information about antibiotics sensitivity profiles.

Table 3: Antibiotic Susceptibility Patterns of Bacterial Isolates (% Sensitive)	Column 1	Column 2	Column 3	Column 4
Antibiotic	<i>S. aureus</i> (n=7)	<i>E. coli</i> (n=4)	<i>P. aeruginosa</i> (n=2)	<i>E. faecalis</i> (n=1)
Amoxicillin	0%	25%	0%	100%
Cephradine	42.90%	50%	0%	0%
Ceftriaxone	57.10%	75%	0%	0%
Cefixime	57.10%	75%	0%	0%
Gentamycin	85.70%	75%	50%	100%
Metronidazole	0%	0%	0%	0%
Levofloxacin	71.40%	75%	50%	0%
Tazobactam	100%	100%	100%	100%



The post-stratification analysis was used to determine the relationship between the wound infection and the variables, i.e., age, gravidity, parity, and BMI. We used the Chi-Square test to determine whether these factors have any statistically significant relationship with the development of wound infection among our study cohort ($p > 0.05$ for all variables).

DISCUSSION

This research aims to collect essential local information on the incidence of infections, causative organisms, and antibiotic susceptibility patterns after emergency cesarean sections conducted at a district hospital. The expected results are expected to create a void in local information, as there are variations in local germ resistance patterns.²² Although available sources report an approximate incidence of infection following an emergency C-section at 7.9% with *S. aureus* and *E. coli* being major pathogens,²³ this research will determine these details specifically in our targeted group of patients at Mirpur, AJK.

Clinical implications of this study are enormous. Many current practices depend on the use of broad-spectrum empirical antibiotics. However, as studies showed high resistance of *S. aureus* to common agents, such as amoxicillin/clavulanate, this approach is seriously threatened by increasing antimicrobial resistance.²⁴ By identifying the most prevalent bacteria and their sensitivity pattern, this study will allow a tailored, evidence-based protocol development. This may, in turn, enhance the effectiveness of treatment of the established infection, reduce the use of ineffective antibiotics, and probably bring about a review in the prophylactic use of antibiotic regimen with better coverage for the most likely pathogens. This will be very critical for the betterment of the patients' conditions, reducing the duration of hospital stay, and alleviating the financial burden placed on the patients—a very critical outcome of this research.

The internal validity of the results can actually be enhanced by the fact that a single surgeon and a consultant microbiologist were used in the research. Nevertheless, using a non-probability sampling technique may restrict the overall validity of the results with regards to the whole population. On the other hand, excluding patients with common comorbidities such as diabetes and high BMI may restrict the overall results since these patients' results will represent a relatively healthy population that undergoes emergency C-sections.

The next research may develop from these results by considering a more representative population or by comparing emergency and elective results.

CONCLUSION

In effect, this would be anticipated to generate critical local data on post-emergency cesarean wound infections. It will describe the regional flora and sensitivity to antibiotics, thereby empowering the clinicians to undertake treatment regimens with a discerning mind in the fight against antimicrobial resistance and enhanced discharge of care. Despite the various limitations of this research, this study will provide a significant foundation to future studies which might supersede the present research and therefore lead to safer surgical outcomes in this group.

LIMITATIONS OF STUDY

The findings of this study are subject to several limitations. The use of a non-probability consecutive sampling technique and the execution of the study at a single center limit the generalizability of the results, as the bacteriological profile and resistance patterns may not reflect other geographical or institutional settings. Furthermore, the necessary exclusion of patients with common high-risk factors such as diabetes and high BMI means the reported infection frequency may be an underestimate compared to the general patient population. Finally, the seven-day follow-up period, while standard, may have missed late-onset or deeper surgical site infections.

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