RESEARCH ARTICLE

Timeline of antibiotics prophylaxis and incidence of surgical site infections in patients of caesarean section at a public sector hospital Karachi

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Abstract

Objective: To assess the effect of the timing of antibiotic prophylaxis on the incidence of surgical site infections in patients undergoing caesarean section in a public-sector tertiary care setting.

Method: The prospective study was conducted at Gynaecology Unit 2 of the Dr Ruth KM Pfau Civil Hospital, Karachi, from November 2023 to April 2024, and comprised adult inpatients aged 18-45 years who had elective or emergency caesarean section. The patients were divided into four groups based on the timing of antibiotic administration; group A <30 minutes, group B 30-60 minutes, group C 60-120 minutes, and group D >120 minutes. All the patients received a single dose of prophylactic antibiotic in the shape pf 2g injection of ceftriaxone. Following hospital discharge, the patients were monitored for wound infection for 30 days. Data was analysed using SPSS 21.

Results: Of the 323 patients with mean age 33.88±6.61 years, 81(25.07%) were in group A with mean age 34.58±6.22 years, 81(25.07%) were in group B with mean age 33.50±6.81 years, 81(25.07%) were in group C with mean age 33.09±6.85 years, and 80(24.76%) were in group D with mean age 35.32±6.33 years. Overall, 36(11.1%) patients developed wound infection; 4(11.1%), 5(13.9%), 12(33.3%) and 15(41.7%) in group A, B, C and D, respectively (p=0.010).

Conclusion: The timing of prophylactic antibiotic administration was found to have significantly affected the occurrence of surgical site infections.

Keywords: Antibiotics, Surgical site infections, Caesarean section, Prophylaxis. (JPMA 76: 172; 2026)

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Introduction

The administration of antibiotics for prophylactic purposes is a well-established practice in reducing the incidence of surgical site infections (SSIs) following caesarean section (CS) procedures.[1,2] In recent years, there has been an increasing attention towards the timing of antibiotic prophylaxis, particularly in relation to its impact on SSIs in patients undergoing CS.[3] The timing of antibiotic administration in relation to the surgical procedure is a critical factor in maximising its efficacy.[4] Numerous studies have evaluated the optimal timing of antibiotic prophylaxis, with the prevailing consensus supporting administration within one hour before skin incision.[5] This timing allows the antibiotic to reach effective tissue concentrations at the surgical site, thereby providing the highest level of protection against possible infections.

However, there are variations in practice regarding the precise timing of administration. Some studies have explored the benefits of administering antibiotics even closer to the time of incision,[6] while others have investigated the potential for postoperative administration. Overall, preoperative administration remains the most common and recommended practice.[7] Cefazolin, a first-generation cephalosporin, is widely used as the antibiotic of choice for prophylaxis in CSs due to its broad spectrum of activity against common surgical pathogens, favourable safety profile, and low cost.[8] Studies have supported its use as an effective agent for preventing SSIs in CS. Guidelines from professional organisations, such as the American College of Obstetricians and Gynaecologists (ACOG) and the World Health Organisation (WHO), emphasise the importance of timely antibiotic administration prior to CS.[9] While these guidelines provide a general framework, adaptations may be necessary based on regional practices and patient-specific factors. The current study was planned to assess the effect of timing of antibiotic prophylaxis on the incidence of SSIs in patients undergoing CS in a public-sector tertiary care hospital.

Patients and Methods

The prospective cohort study was conducted at Gynaecology Unit 2 of the Dr Ruth KM Pfau Civil Hospital, Karachi, from November 2023 to April 2024. After approval from the institutional ethical review committee, the sample size was calculated using Openepi[10] online calculator, taking SSI prevalence 29.7%[11] at 95% confidence interval (CI) and 5% margin of error. The sample was raised using consecutive sampling technique. All adult inpatients age

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18-45 years who had elective or emergency CS were included. Discharged patients who came back with SSIs within 30 days of exploration were also included. Patients with history of re-operating within three months, vaginal deliveries, exploratory laparotomy gynaecological procedure, multiple or non-standard antibiotic prophylaxis regimens, CS with additional complex procedures or complications, like hysterectomy, that could independently impact SSI rates, recent abdominal surgeries, and those having specific conditions, such as immuno-suppression, poorly-controlled diabetes, or other chronic conditions, were excluded. Written informed consent was obtained from all the patients.

The patients were divided into four groups based on the timing of antibiotic administration; group A <30 minutes, group B 30-60 minutes, group C 60-120 minutes, and group D>120 minutes. In each group, a single dose of prophylactic antibiotic was administered according to the specific timeline in the shape of a 2g injection of ceftriaxone.

Data was collected using a structured proforma with the help of a predesigned questionnaire. This included demographic information of the patients, the date and time of surgery, the selection and timing of antibiotics administered preoperatively, and the follow-up of patients for any signs of inflammation at the wound site. Additionally, if available, pus culture results were noted.

Data was analysed using SPSS 21 and 26. Frequencies and percentages were computed for categorical variables, while numerical variables were presented as mean± standard deviation after assessing data normality with Shapiro-Wilk test. Chi-square test was used to compare categorical variables among the groups, whereas numerical variables were compared using one-way analysis of variance (ANOVA). P<0.05 was taken as statistically significant.

Results

Of the 323 patients with mean age 33.88±6.61 years, 81(25.07%) were in group A with mean age 34.58±6.22 years, 81(25.07%) were in group B with mean age 33.50±6.81 years, 81(25.07%) were in group C with mean age 33.09±6.85 years, and 80(24.76%) were in group D with mean age 35.32±6.33 years.

Overall mean BMI was 24.4±4.1kg/m^2. In group A, 7(8.6%), 48(59.3%), 20(24.7%) and 6(7.4%) patients were underweight, normal, overweight and obese, respectively. In group B, the corresponding values were 4(4.9%), 41(50.6%), 28(34.6%) and 8(9.9%). In group C, the corresponding values were 6(7.4%), 45(55.6%), 23(28.4%) and 24(30.0%), and in group D, they were 7(8.8%), 42(52.5%), 24(30.0%) and 7(8.8%) (p=0.95). The mean hospital stay was 8.04±1.03 days, 8.19±0.96 days, 8.07±1.08 days and 8.17±1.01 days in groups A, B, C and D, respectively (p=0.74) (Table).

Overall, 36(11.1%) patients developed wound infection; 4(11.1%), 5(13.9%), 12(33.3%) and 15(41.7%) in group A, B,

Table: Frequency of wound infection and other demographic characteristics of patients in the study groups.

	Group A n (%)	Group B n (%)	Group C n (%)	Group D n (%)	p-value n (%)
Wound Infection	4(11.1)	5(13.9)	12(33.3)	15(41.7)	0.01
MeanAge (years)	34.58±6.22	33.50±6.81	33.09±6.85	35.32±6.33	0.12
BMI (Kg/m^2)					
Under Weight	7(8.6)	4(4.9)	6(7.4)	7(8.8)	0.95
Normal	48(59.3)	41(50.6)	45(55.6)	42(52.5)	
Overweight	20(24.7)	28(34.6)	23(28.4)	24(30.0)	
Obesity	6(7.4)	8(9.9)	7(8.6)	7(8.8)	
Mean Hospital Stay	8.04±1.03	8.19±0.96	8.07±1.08	8.17±1.01	0.74
Type of Operation					
Elective caesarean section	62(76.5)	60(74.1)	65(80.2)	62(77.5)	0.82
Emergency caesarean section	19(23.5)	21(25.9)	16(19.8)	18(22.5)	

BMI: Body mass index.

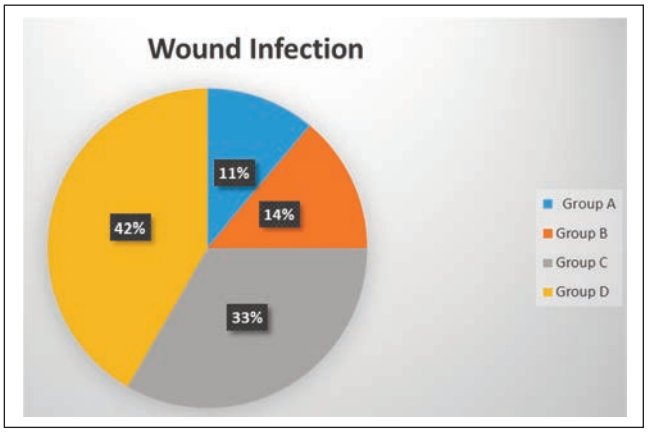

Figure-1: Frequency of wound infection across the study groups.

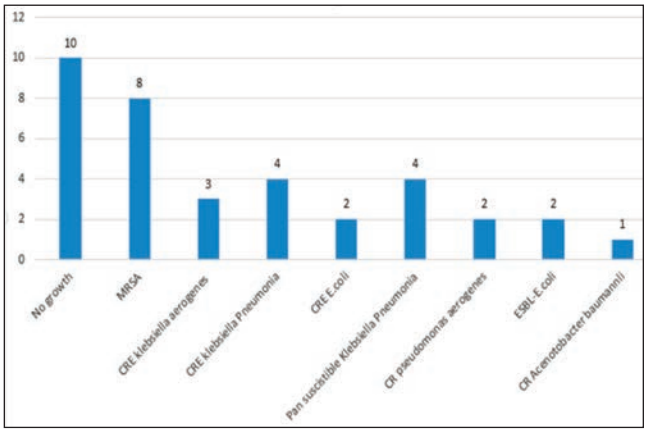

Figure-2: Sensitivity and resistance pattern of the organisms.

C and D, respectively (p=0.010) (Figure 1). Sensitivity and resistance pattern of the organisms were also noted (Figure 2).

Discussion

SSIs are characterised as infections affecting either the superficial or deep layers of the skin incision or an organ or body space, manifesting within 30 days following surgery.[12] The present study found SSIs in 4(11.1%), 5(13.9%), 12(33.3%) and 15(41.7%) patients in groups A, B, C and D, respectively (p=0.010). The finding was in line with a study by Kalpana Basany et al.[5] The incidence of SSI was within the range found in most Indian studies, where the prevalence has been reported to vary from 3.12% to 24.2% over the past decade.[13-17]

In the current study, all the four groups received antibiotics preoperatively at different time points. The findings suggested that the timing of antibiotic administration in relation to CS played a significant role in determining SSI rates.

The risk of SSIs can vary depending on patient-specific factors, such as age, health status, and comorbidities, as well as procedural factors, such as surgical technique and duration. Additionally, the efficacy and spectrum of the antibiotics used for prophylaxis can influence the risk of SSIs. However, research suggests that the timing of prophylactic antibiotic administration may not be a significant factor in determining the risk of SSI.[5] Although following a time-based antibiotic prophylaxis protocol is not considered poor medical practice, there is limited evidence to indicate that it significantly improves care outcomes.

The use of preoperative antibiotic prophylaxis is widely accepted as an effective measure to reduce the frequency of SSIs, but the optimal timing for administering the antibiotics remains a topic of ongoing debate. A systematic review and meta-analysis involving more than 54,000 patients found that the risk of SSIs nearly doubled when antibiotics were administered after the first incision compared to more than two hours before the incision. Nonetheless, there was no significant difference in the rate of infections when antibiotics were given within one hour or two hours prior to incision.[18]

The present study has limitations as it was conducted at a single institution with a limited sample size. The timing of prophylactic antibiotics may vary from institute to institute. Moreover, other factors, including patients' hygiene levels, operating room environment, as well as type and duration of antibiotics, were not controlled as confounders in analysis which could have impacted SSI incidence. Thus, the findings cannot be generalised to overall Pakistani settings.

Future studies with larger sample sizes are recommended for the validation of the current findings. Future research may incorporate both retrospective and prospective designs. Through retrospective studies, researchers may examine the relationship between the timing of antibiotic administration and the incidence of infection following surgical procedures by analysing historical data. This approach would allow for the comparison of infection rates with different timing regimens, providing insight into potential patterns and associations.

Conclusion

The timing of prophylactic antibiotic administration seemed to significantly affect the occurrence of SSI. However, the topic needs further research.

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Conflict of Interest: None.

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SI: Writing, data analysis and design.
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