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PROPHYLACTIC SINGLE DOSE VERSUS REGULAR MULTI-DOSE ANTIBIOTIC USAGE IN CAESAREAN SECTION: A PROSPECTIVE COMPARATIVE STUDY

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ABSTRACT

Aims: To compare the effectiveness of single-dose versus multiple-dose antibiotic prophylaxis in preventing postoperative infections in women undergoing elective Caesarean sections. **Study Design:** Prospective Comparative Study **Place and Duration of Study:** Department of Obstetrics & Gynecology, M.T.H. Hospital, Indore, India, over 12 months (March 2023 – March 2024) **Methodology:** A total of 323 women undergoing elective Caesarean sections were divided into Group A (single-dose antibiotics) and Group B (multiple-dose antibiotics). Group A received a single intra-operative dose of IV ceftriaxone and metronidazole. Group B received multiple doses of the same antibiotics (IV ceftriaxone 1 gm 12 hourly and IV metronidazole 500mg 8 hourly) for two days followed by oral antibiotics. Postoperative parameters were monitored till day 5 and analyzed statistically. Data was analyzed using IBM SPSS Version 22. Chi-square and t-tests were used where appropriate. P-value <0.05 was considered statistically significant. **Results:** There was no statistically significant difference between the two groups in terms of postoperative febrile morbidity, wound infection, urinary tract infection, or abnormal lochia. Both groups were comparable in demographic profiles and operative characteristics. **Conclusion:** Single-dose antibiotic prophylaxis is as effective as multiple-dose regimens for elective Caesarean sections and can be recommended to reduce antibiotic resistance and healthcare costs.

KEYWORDS : Caesarean section, Antibiotic prophylaxis, Single-dose regimen, Multiple dose regimen, Infection prevention.

INTRODUCTION

The Caesarean section (C-section) is one of the most common surgical procedures performed worldwide, accounting for a significant proportion of deliveries. While advances in surgical technique and aseptic practices have improved maternal outcomes, postoperative infections remain a major source of morbidity. The use of prophylactic antibiotics has become a standard practice to minimize infection risks, including surgical site infections, endometritis, urinary tract infections, and wound dehiscence.

Traditionally, multiple-dose antibiotic regimens have been administered postoperatively to prevent infection. However, with the rising concerns over antibiotic resistance, adverse effects, and healthcare costs, there has been a paradigm shift toward exploring single-dose antibiotic prophylaxis. The rationale for a single dose is based on achieving adequate tissue concentrations at the time of potential bacterial exposure during surgery, thus negating the need for prolonged antibiotic administration.

Several studies have evaluated the efficacy of single versus multiple antibiotic doses, with mixed results. Some have shown equivalent efficacy with single-dose regimens, while others continue to support multi-dose strategies, especially in high-risk cases. A consensus is gradually building that a single, well-timed dose may be sufficient for most uncomplicated elective C-sections.

Given the implications for public health, including reducing antimicrobial resistance, hospital costs, and improving patient compliance, it is crucial to evaluate these approaches systematically. This study aims to compare the effectiveness of a single intra-operative dose of antibiotics versus a traditional multiple-dose regimen in preventing postoperative infections in women undergoing elective Caesarean sections.

2. MATERIAL AND METHODS

2.1 Study Design And Setting

This was a prospective comparative study conducted at the Department of Obstetrics and Gynecology, M.T.H. Hospital, Indore, over 12 months (March 2023 – March 2024)

2.2 Sample Size And Population

Sample size was calculated using G-power software (version 3.1.9.4) with a two-sided alpha of 5% and power of 80%, resulting in a total of 323 patients: 145 in Group A and 178 in Group B.

2.3 Inclusion Criteria

- Women undergoing elective Caesarean sections
- No co-morbidities
- Provided informed consent

2.4 Exclusion Criteria

- Refusal to consent
- Pre-existing infections
- Immunocompromised state
- Prolonged rupture of membranes (>24 hours)
- Chorioamnionitis
- Prolonged operation time
- Existing urinary tract infection
- Prolonged catheterization (>48 hours)

2.5 Intervention

Group A received a single intravenous dose of IV Ceftriaxone (1 gm) and IV Metronidazole (500 mg) intra-operatively after umbilical cord clamping. Group B received intravenous Ceftriaxone 1gm every 12 hours and Metronidazole 500mg every 8 hours for two days, followed by oral antibiotics.

2.6 Data Collection And Statistical Analysis

Postoperative parameters including fever (>100.4°F), pulse rate (>100 bpm), wound infection, abnormal lochia, and culture results were recorded till postoperative day 5. Data was analyzed using IBM SPSS Version 22. Chi-square and t-tests were used where appropriate. P-value <0.05 was considered statistically significant.

3. RESULTS AND DISCUSSION

3.1 Distribution of patients according to Antibiotic dose. (N=323)

145 (44.9%) patients were in the single antibiotic dose group; and 178 (55.1%) patients were in multidose group of antibiotic.

3.2 Demographic Characteristics

The majority of patients in both groups belonged to the 26-30 years age group. No significant demographic differences were observed between the groups.

Parameter	Group A (n=145)	Group B (n=178)
Mean Age (years)	27.4 ± 4.1	27.8 ± 4.3
Primigravida (%)	60 (41.4%)	72 (40.4%)
Multigravida (%)	85 (58.6%)	106 (59.6%)
BMI (%)	23.08 ± 2.69	22.95 ± 2.80
Literate	61 (42.1%)	92 (51.7%)

3.3 Indication of Caesarean Section in both the Groups

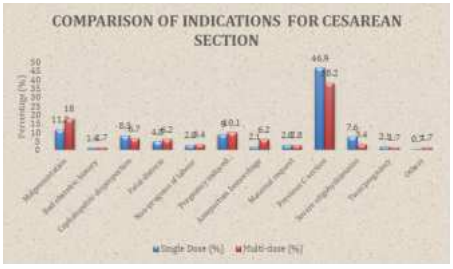

Figure 1. Bar Diagram Comparing the Indications for Caesarean Section between the two groups (N=323)

Pearson chi-square test applied. Chi-square value=10.781, df=11, P value=0.462, Not significant.

The indications of c-section were comparitive in both the groups, with previous c-section being the most common (group A = 46.9%, group B = 38.2%) followed by malpresentation (group A = 11.7%, group B = 18%), and hence statistically not significant.

3.4 Clinical Outcomes

Table 1: Comparison of Suture Line Status between the two groups (N=323)

Suture Line Status	Single Antibiotic Dose (n=145)	%	Multidose Antibiotic (n=178)	%
Healthy	133	91.7	166	93.3
Suture line discharge with gapping present	2	1.4	3	1.7
Suture line discharge present	10	6.9	9	5.1
Total	145	100.0	178	100.0

Pearson chi-square test applied. Chi-square value=0.529, df=2, P value=0.768, Not significant.

Table 2: Comparison of Postoperative Complications between the two groups (N=323)

Postoperative Complications	Single Antibiotic Dose (n=145) No.	%	Multidose Antibiotic (n=178) No.	%
None	121	83.4	157	88.2
Fever	12	8.3	10	5.6
Wound infection	12	8.3	11	6.2
Total	145	100.0	178	100.0

Pearson chi-square test applied. Chi-square value=1.532, df=2, P value=0.465, Not significant.

As seen from the tables 1 & 2, there is no significant difference between groups A and B with respect to febrile morbidity (P=0.567), suture line status (P=0.768), urinary tract infections (P=0.741) and post operative complications (P=0.465). Hence statistically not significant.

3.5 Table 3: Comparison of Culture & Sensitivity reports between the two groups

Specimen Type	Organism Detected	Single-Dose Group (n=145)	Multi-Dose Group (n=178)
Pus Culture	Klebsiella pneumoniae	5 (3.4%)	3 (1.7%)
	Staphylococcus CONS	2 (1.4%)	-
	Staphylococcus aureus	1 (0.7%)	3 (1.7%)
	Staphylococcus epidermidis	-	1 (0.6%)
	No growth	4 (2.8%)	4 (2.2%)
Blood Culture	Klebsiella pneumoniae	1 (0.7%)	1 (0.6%)
	MRSA	1 (0.7%)	1 (0.6%)
	Staphylococcus CONS	1 (0.7%)	-
	Staphylococcus aureus	2 (1.4%)	1 (0.6%)
	No growth	21 (14.5%)	27 (15.2%)
High Vaginal Swab	E. coli	1 (0.7%)	-
	Klebsiella pneumoniae	-	1 (0.6%)
	No growth	13 (9%)	12 (6.7%)

There was **no statistically significant association** between pus culture/sensitivity (P=0.186) between blood culture/ sensitivity (P=0.865), and between high vaginal swab culture / sensitivity (P=0.457) between both the groups.

These findings are consistent with previous studies (Igwemadu et al., 2015; Sundharam et al., 2018; Smaill and Grivell, 2014; Tita et al., 2016).

3.6 Nterpretation

Given the comparable infection rates and wound healing patterns, along with reduced antibiotic exposure, single-dose prophylaxis presents a safe, cost-effective, and practical strategy for infection prevention post-Caesarean section. This is particularly beneficial for government hospitals and resource-constrained settings aiming to reduce hospital stay and antibiotic resistance.

4. CONCLUSION

The study compared the effectiveness of prophylactic single dose (IV Inj Ceftriaxone 1gm and IV Inj Metronidazole 500 mg stat)versus multidose(IV Inj Ceftriaxone 1gm12 hourly and IV Inj Metronidazole 500mg 8 hourly for 2 days followed by oral antibiotics) antibiotic regimens for caesarean section procedures at a tertiary care hospital Firstly, the absence of significant discrepancies across various demographics (age,gravidity, parity, educational status, and BMI) and clinical parameters (indication for caesarean section, suture line integrity, presence of infection-related symptoms, and postoperative complications) underscores the equivalency of both antibiotic protocols in preventing postoperative surgical site infections. Moreover, adopting a single dose regimen offers potential advantages such as enhanced patient compliance due to reduced dosing frequency, streamlined administration protocols, and potentially lower overall treatment costs. Single-dose antibiotics lower the exposure to adverse reactions or effects of antibiotics, reduce patient risk, and enhance overall safety. Additionally, this approach alleviates the manpower burden in hospital settings, minimizing the discomfort caused to patients by prolonged use of antibiotics, IV cannulas, and extended hospital stays. Additionally, both groups showed comparable efficacy and safety profiles underscore their suitability for clinical practice, allowing clinicians to tailor antibiotic prophylaxis strategies based on individual patient needs while optimizing resource utilization and minimizing the risk of antimicrobial resistance.

Implementing such strategies can aid in developing standard treatment guidelines and policies at both institutional and broader levels. Moreover, this can mitigate the financial burden associated with the high cost of antibiotics, prolonged treatments, and extended hospital stays. These findings contribute to a nuanced understanding of antibiotic stewardship practices in obstetric care and underscore the importance of evidence-based decision-making in promoting patient outcomes and healthcare efficiency.

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Competing Interests
Authors have declared that no competing interests exist.

Author's Contribution
Dr.Aastha Vinayaka collected and analysed the data and wrote the manuscript. Dr. Hemalata Jharbade and Dr. Surabhi Porwal designed the study and assisted with data collection, literature review and manuscript preparation.

Consent
All authors declare that 'written informed consent was obtained from all the participating patient (or other approved parties) for the conduction of this study and publication of this paper. A copy of the written consent is available for review by the Editorial office/Chief Editor/Editorial Board members of this journal.

Ethical Approval
All authors hereby declare that all experiments have been examined and approved by the Institutional Ethics Committee, M.G.M. Medical College, Indore. Each study population was informed about the objective and procedure of the study.

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