

Short-Term Versus Long-Term Antibiotic Prophylaxis for Elective Cesarean Section Deliveries, Prospective Comparative Study

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Abstract:

Background: An increased risk of postpartum infectious problems is linked to Cesarean section's deliveries. Prolonged post-surgical antibiotic courses are often used despite data suggesting shorter regimens. In this trial, short term and long-term antibiotic prophylaxis were compared in low-risk women undergoing elective Cesarean sections deliveries.

Methods: From January to June, two hundred and forty low risk term pregnant women underwent elective Cesarean section at Minya El-Qamh Central Hospital and Zagazig University Hospitals were included in this prospective comparative study with systematic allocation. Participants were allocated into two equal groups according to odd/even sequence numbers. Group A, n=120 (short-term) received two intravenous doses of cefotaxime 1 gm, 12 hours apart, whereas Group B, n=120 (long-term) received the same as group A followed by cefotaxime twice daily for another two days followed by oral cefixime (400 mg, once /day) for another three days. Patients were followed for the next six weeks for postoperative infectious morbidity.

Results: No statistically significant differences in measured postoperative morbidities were detected. Postpartum fever occurred in 10.0% of Group A (short-term antibiotic prophylaxis) versus 7.5% of Group B (long-term antibiotic prophylaxis) ($P = 0.49$), endometritis diagnosed in 0.8% versus 1.7% ($P = 0.99$), respectively. Superficial wound infection affected 2.5% versus 1.7%, deep wound infection affected 0.8% in each group, urinary tract infections (UTI) diagnosed in 5.8% versus 3.3% ($P = 0.54$), and hospital stay was similar (17.8 ± 3.2 versus 18.1 ± 3.4 hours; $P = 0.482$) in both groups.

Conclusion: short-term antibiotic prophylaxis was not associated with a statistically significant increase in measured postoperative infectious morbidities compared to prolonged antibiotic prophylaxis perioperative and post-operative elective Cesarean section deliveries, that support reduced antibiotic exposure especially in low resources countries like Egypt.

Keywords: Cesarean section; Antibiotic prophylaxis; Postoperative infection.

Introduction:

From roughly 20% in early surveys to over 50% in the Egypt Demographic and Health Survey 2014 and nearly 72% in more recent national statistics, the rate of Cesarean sections in Egypt has significantly increased over the past few decades [1]. Compared to vaginal deliveries, the incidence of postoperative infections, such as wound sepsis and abnormal vaginal discharge, is five to twenty times higher after Cesarean sections. Inadequate aseptic measures or defective surgical methods could be the cause of this rise [2].

With reported rates ranging from 18% to 83%, infectious complications after Cesarean section are a common problem [3,4]. Nonetheless, it has been observed that preventive antibiotic treatment considerably lowers this incidence of postpartum infections [5,6].

According to many studies and meta-analyses, prophylactic antibiotics significantly reduce post-surgical infectious morbidities, including up to a 75% reduction in endometritis, wound infections, and postoperative fever. For women undergoing elective Cesarean sections, prophylactic antibiotics to prevent infections is firmly supported by this evidence [5,6].

Antibiotics are used for several days in our practice. In contrast, much research has shown no statistically significant advantage of prolonged over short-term prophylactic antibiotic use for reducing postpartum infections after Cesarean delivery [7, 8].

This study aimed to compare short-term versus prolonged antibiotic prophylaxis in preventing postoperative infectious morbidity after elective Cesarean section in low-risk women.

Methods:

This prospective comparative study with systematic allocation was conducted among 240 term pregnant women admitted to Minya El-Qamh Central Hospital and Zagazig University Hospitals for elective cesarean section. Between January 2025 and June 2025, participants were allocated into two groups of 120 each. In accordance with Zagazig University Hospital protocol, ZU- IRB approval # 815/13, Nov-2024, and all participants provided written informed consent.

Group A (short-term antibiotic prophylaxis): day1; patients received Cefotaxime 1g IV twice: 1st dose, 30 to 60 minutes prior to skin incision and 2nd one, 12 hours later,

Group B (prolonged antibiotic prophylaxis); as in Group A in day 1, followed by cefotaxime 1g IV twice per day for another two days (day 2& day3) (total 6 gm), and followed by oral cefixime 400 mg once per day for more three days (day 4, day 5, and day 6).

Low risk (no medical, surgical, or obstetric risk factors), singleton gestation, BMI < 35 kg/m² at admission, normal preoperative laboratory result (CBC, kidney, liver, and coagulation profiles), were the inclusion criteria.

Women with known allergies or positive sensitivity tests to injectable cefotaxime, unplanned or emergency procedures, antibiotic treatment two weeks prior to the surgery, ruptured membrane before delivery (PROM), and medical conditions (hypertensive disorder, diabetes mellitus, anemia, and immune-compromised state) were excluded.

Name, age, place of residence, occupation, smoking status, history of medication usage, and known antibiotic allergies were all included in personal history. The date of the most recent menstrual cycle and cycle regularity were recorded in the menstrual history. Gravidity, parity, history of miscarriages, stillbirths, live births, and prior pregnancy problems were all included in the obstetric history. In addition to related problems, current drug use (including antibiotics), and recent medications, the history of the present pregnancy included gestational age as assessed by the last menstrual cycle or, if available, a first-trimester ultrasound. The patient's past medical and surgical history was examined, including any chronic illnesses, prior surgeries (such as C-sections and abdominal surgeries), and infection history. Immunization status was evaluated, especially for influenza and tetanus.

A general, abdominal, and local examination was carried out, including a pelvic examination to evaluate cervical dilation, effacement, and identify any discharge and/or signs of infection, as well as an examination of the incision site (if relevant) to look for edema, discomfort, or evidence of infection. Laboratory tests: blood glucose levels, liver and kidney function tests, coagulation profile, complete blood count (CBC) to check for infection or anemia, and urine analysis to look for UTIs or other anomalies were carried out.

Using a straightforward randomization technique, the patients were divided into two groups of 120 each. Patients with odd numbers were given short-term antibiotic prophylaxis, whereas those with even numbers were given long-term antibiotic prophylaxis.

Patients from Both groups were subjected to regional spinal anesthesia, complete aseptic preparations, Pfannenstiel incision, opening of subcutaneous tissue and opening of rectus sheath through a transverse incision then separation of the recti muscles, good exposure of lower uterine segment to be opened by a C-shaped incision,

delivery of the baby & clamping of the cord, followed by administration of oxytocin, assisted spontaneous delivery of the placenta with controlled cord traction and uterine massage, closure of the uterus in two layers and ensure good hemostasis, approximation of the recti muscles, and closure of the rectus sheath, closure of subcutaneous fat if more than 2cm thickness and finally closure of the skin by subcuticular sutures, cover surgical incisions with an appropriate sterile pad dressing at the end of the operation, use an aseptic non-touch technique for changing or removing surgical wound dressings, follow up of the patient as long as she is hospitalized and upon hospital discharge, women were instructed to report any fever, wound symptoms (e.g. pain, discharge, redness, and/or swelling), or foul-smelling lochia immediately.

For six weeks period post-surgery, patients were observed for any signs of postpartum infectious problems, such as fever, wound infection, endometritis, or urinary tract infection. Following surgery, patients were monitored both clinically and in the lab as part of the follow-up routine (patients were phoned). At 1st 8–12 hours after surgery, on 10th day (suture removal), and at 6th weeks (contraception appointment), the wound was assessed. To check for infection symptoms (pain, redness, induration, and purulent, serous, or serosanguinous discharge, with or without fever). A clinic visit was arranged for patients who reported any of these symptoms. Antibiotics were initiated depending on sensitivity after cultures were obtained for purulent discharge.

patients were assessed for thrombophlebitis, drug fever, blood transfusion reaction, respiratory tract infections, breast engorgement or mastitis, and other clinically suspected illnesses to rule out other possible causes of postpartum fever. Postoperative fever, endometritis, wound infection, urinary tract infection (UTI), and length of hospital stay (hours) were among the outcome measures.

Statistical Analysis

The SPSS software (Statistical Package for Social Science) version 27.0 was used to computerize and statistically analyze the gathered data (IBM, 2020). Frequencies and relative percentages were used to display qualitative data. To determine the difference between qualitative variables, the Chi-square test was employed. When one or more of the examined cells were less than five, Fisher's exact test was utilized to determine the difference between qualitative variables in various groups. Mean $\pm$ SD (standard deviation) was used to express quantitative data. The difference between quantitative variables in two groups of normally distributed data was determined using the independent T test. In non-normally distributed data, the Mann Whitney (MW) test was employed to determine the difference between quantitative variables in two groups.

Results

Our patients' ages ranged from 20 and 35 years. their BMI ranged from 22 to 30 kg/m². The GA was between 37 and 40 weeks, and majority of our included cases were multigravida (**Table1**). A prior LSCS was the most frequent indication for CS delivery followed by CPD and malpresentation (**Table2**). Regarding intraoperative outcomes, there were no statistically significant differences between the two groups, both groups had similar mean cesarean section (operative time) durations (49.1 ± 5.7 vs. 47.8 ± 5.6 minutes, $P = 0.08$), all cases in both groups achieved spontaneous placental delivery (**Table 3**). There was no significant difference in the duration of hospital stay, and post-operative recovery between both groups. The two groups under investigation had similar postoperative recovery results (17.8 ± 3.2 hours (Group A) versus 18.1 ± 3.4 hours (Group B) ($P = 0.482$), there was no significant difference in time of development, and rate of postoperative development of postpartum fever (42.3 ± 12.4 (group A) versus 38.6 ± 10.8 hours (group B) respectively; $P = 0.38$) (**Table 3,4**).

Post Cs endometritis (Clinically (postpartum fever, lower abdomen pain, uterine tenderness, and purulent or foul-smelling lochia), laboratory,(CBC), and radiology (pelvic ultrasonography; thicker, heterogeneous endometrium, fluid accumulation in the uterus, and foci of air inside the uterine cavity) did not significantly differ between Group A and Group B (**Table 4**).

Post-operative wound infection (Based on clinical signs such erythema, edema, purulent discharge, and/or increased discomfort) was nearly similar in both groups. Wound infections were frequently identified between days three and seven after surgery. Three patients in the group who received short-term antibiotic

prophylaxis had superficial wound infections (skin and subcutaneous tissue), compared to two in long-term antibiotic group. These infections were treated conservatively with local wound care, frequent dressing changes, while; one patient in each group had deep wound infection caused by *E. coli* organism (based on culture results) that required ceftriaxone 1 g intravenously once daily for a period of 5–7 days, in addition to local wound care and frequent dressing, and strict clinical monitoring, while; secondary suturing was not necessary in the two cases (Table 4).

Only one patient in each group had a combined endometritis, and deep wound infection (Table 4). There was no significant difference in the occurrence of UTIs between both groups (5.8% Group A versus 3.3% Group B) (Table 4).

Table (1): Demographic data among studied groups

Variable		Group A (120)	Group B (120)	P value
Age (Years)	Range	20–35	20–35	0.07
BMI (kg/m ²)	Range	22.1–29.9	21.3–29.1	0.206
GA (weeks)	Range	37–40	37–40	0.182
Gravidity	Primigravida	19(15.8%)	22 (18.3%)	0.732
	Multigravida	101 (84.2%)	98 (81.7%)	

Table (2): Indication for CS among studied groups

Indications for C.s	Group 1 (120)	Group 2 (120)	P value
Previous LSCS (Total)	101(84.2%)	101 (84.2%)	1.000
- Previous 1 LSCS	80 (66.7%)	78 (65%)	
- Repeated C. S	21 (17.5%)	23 (19.2%)	
Malpresentation (Total)	16 (13.3%)	18 (15%)	0.853
-Breech	15 (12.5%)	17 (14.2%)	
-Transverse fetal Lie	1 (0.8%)	1 (0.8%)	
CPD	3 (2.5%)	1 (0.8%)	0.622

Table (3): pre and post operative findings among the studied groups.

Variable	Item	Group A (120)	Group B (120)	P value
Duration of CS (min)	Mean $\pm$ SD	49.1 $\pm$ 5.7	47.8 $\pm$ 5.6	0.08
	Range	40–60	38–57	0.08
Mode of placental delivery	Manual removal of placenta	0 (0.0%)	0 (0.0%)	1

	Spontaneous placental delivery	120 (100.0%)	120 (100.0%)	
Duration of hospital stay (hours)	Mean ± SD	17.8±3.2	18.1±3.4	0.482
	Range	12–24	12–24	
Time of onset of postpartum fever (hours)	Mean ± SD	42.3±12.4	38.6±10.8	0.38
	Range	24–96	24–72	

H: Hours, SD: Standard Deviation.

Table (4): Postoperative morbidity among studied groups

Category		Group A (120)	Group B (120)	P value
Fever		12 (10%)	9 (7.5%)	0.49
temp (≥ 38°C)				
Endometritis		1 (0.8%)	2 (1.7%)	0.99
Wound Infection :		3 (2.5%)	2 (1.7%)	0.99
Superficial				
Deep		1 (0.8%)	1(0.8%)	
Type of wound Infection	Induration	2 (1.7%)	2 (1.7%)	0.83
	Serous discharge	1(0.8%)	1(0.8%)	
	Purulent discharge	1(0.8%)	0 (0.0%)	
UTI		7 (5.8%)	4 (3.3%)	0.54
Combined		1 (0.8%)	1 (0.8%)	1.00
Deep wound infection + high fever				
24hr after surgery (≥ 38°C)+				
endometritis				

UTI: Urinary Tract Infection. The combined-morbidity patient in each group was already included in the individual fever, endometritis, and deep wound infection rows and was not counted as an additional event.

Discussion

Using prophylactic antibiotic has been shown to minimize surgical site infections and endometritis following Cesarean delivery by up to 66%–75% [9].

Our aim was to compare long-term versus short-term antibiotic prophylaxis for low-risk patients following elective Cesarean section in reducing post operative infectious morbidity

Two hundred and forty low risk (obstetric, medical and surgical) term pregnant women who were scheduled for Cesarean delivery were included in prospective comparative study with systematic allocation, at Obstetrics and Gynecology Department, Zagazig University Hospitals and the Obstetrics and Gynecology Department, Minya El-Qamh Central Hospital. The patients were split into two groups of 120 each at random: Group A (short term prophylaxis); day 1; patients received Cefotaxime 1g IV twice: 1st dose, 30 to 60 minutes prior to skin incision and 2nd one, 12 hours later, while group B (long term prophylaxis); as in Group A in day 1, followed by cefotaxime 1g IV twice per day for another two days (day 2 & day 3) (total 6 gm), and followed by oral cefixime 400 mg once per day for more three days (day 4, day 5, and day 6).

There were no statistically significant differences ($p > 0.05$) between the two studied groups in this study in terms of baseline demographic and obstetric variables, including age, BMI, gestational age, parity, and indication for Cs, that aligned with the design principles of comparable randomized controlled trials conducted by Ezeike et al. [8], Adaji et al. [10], and Ija Rotimi et al. [7].

Repeated lower segment Cesarean sections (LSCS) accounted for 84.2% of CS cases in both groups in this study, followed by malpresentation (13.3% vs. 15.0%) and CPD (2.5% vs. 0.8%) in Groups 1 and 2, respectively. This pattern is consistent with the results of Adaji et al. [10]; prior one or more CS was the most common indication (28.8% and 30.9%, respectively, $P=0.464$). All Cesarean sections were carried out by a single surgeon (Obstetric Consultant) uniforming the operating circumstances; The duration of the procedure varied from 38 to 60 minutes. Despite the standardized surgical setting, this variation in operating time may represent case-to-case variations in surgical difficulty and intraoperative discoveries. The two groups' operative times did not differ statistically significantly, and extended surgical duration was found to be an independent risk factor for surgical site infection, making it clinically relevant [11].

There was no statistically significant difference between the two groups ($p=0.49$) in the incidence of post-Cesarean fever (oral temperature $>38^{\circ}\text{C}$ on two separate occasions with excluding the first 24 hours post-surgery), which was 10% in Group A (short-term prophylaxis) and 7.5% in Group B (long-term prophylaxis), mostly were low-grade ($<39^{\circ}\text{C}$). These results were like those published by Ezeike et al. [8], who found no statistically significant difference in febrile morbidity between short- and long-course prophylaxis groups in a randomized trial comparing a single-dose ceftriaxone/metronidazole versus a multi-day postoperative regimen.

Extending prophylaxis beyond the immediate perioperative period does not significantly reduce postoperative febrile episodes is further supported by Ijarotimi et al. [7], who reported febrile morbidity rates of 17% and 18% in their short- and long-course groups, respectively ($p = 0.852$). When comparing single-dose cefotaxime with amoxicillin-clavulanic acid for CS prophylaxis, Kamilya et al. [12] also found no statistically significant difference in febrile morbidity, supporting that the antibiotic class and duration of coverage, within an appropriate spectrum, are similarly protective. Barsha et al. [13] compared the efficacy of a short-term versus long-term course of prophylactic antibiotics for post-operative Cesarean section wounds using cefotaxime/ceftriaxone-based therapy and found no obvious difference in febrile morbidity between the two groups.

By using clinical signs (fever $\geq 38^{\circ}\text{C}$ for more than 24 hours, lower abdominal pain, foul-smelling vaginal discharge, uterine tenderness, and purulent cervical secretions) and radiological findings (pelvic ultrasonography showing thickened heterogeneous endometrium, fluid in uterine cavity, and intrauterine air foci) are used to diagnose endometritis, there was no statistically significant difference between the rates of endometritis in short term antibiotic prophylaxis group, and long term antibiotic prophylaxis (0.8% and 1.7%, respectively). This result was closely matched with those of Mohammed et al. [14], who found similar endometritis rates in women receiving two doses of 1.2 g amoxicillin-clavulanic acid versus a 7-day course of amoxicillin-clavulanic acid and metronidazole following CS, and Adaji et al. [10], who used intravenous cefuroxime and metronidazole

for 48 hours in the short-course group and extended oral cefuroxime plus metronidazole for five days in the long-course group.

Ijarotimi et al. [7] used Ampiclox and metronidazole intravenously for 24 hours in the short-course group versus 48 hours followed by oral therapy for 5 days in the long-course group and reported endometritis rates of 3% and 2% in their short-and long-course groups, respectively ($p = 0.367$) which was insignificant.

In this current study, there was no statistically significant difference in the overall wound infection rate between the two groups (3.3% in Group A versus 2.5% in Group B). deep wound infections (including the fascia) occurred at a similar rate in both groups (0.8% each), while superficial wound infections (involving skin and subcutaneous tissue) were slightly more common in Group A (2.5% versus 1.7%).

Wound infections were diagnosed in both groups between 3rd and 7th day after surgery. *E. coli* was found to be the most common organism in culture from both superficial and deep infections; patients were then treated with IV ceftriaxone in addition to wound care, with need for secondary suturing.

Ijarotimi et al. [7] conducted a randomized study in which patients received either a short-course or long-course antibiotic regimen consisting of Ampiclox (4 intravenous doses: 1 g stat followed by 500 mg every 6 hours) and Metronidazole (3 intravenous doses of 500 mg every 8 hours) for 24 hours, or the same combination administered intravenously for 48 hours followed by oral therapy for 5 days and reported wound infection rates of 4% in the short-course group and 3% in the long-course group, with no statistically significant difference between the two regimens.

Adaji et al. [10] conducted a randomized study including 248 women who were equally allocated into two groups. All participants received intravenous cefuroxime (750 mg every 12 hours) and intravenous metronidazole (400 mg every 8 hours) for 48 hours, while the long-term group additionally received oral cefuroxime (500 mg every 12 hours) and metronidazole (400 mg every 8 hours) for more 5 days, and reported that the wound infection rate was not significantly different between the two groups (1.3% vs. 3.3%, $P = 0.136$). Also; *Escherichia coli* was identified as the most common pathogen, accounting for 36.4% of infected wounds.

UTI occurred more in short term antibiotic prophylaxis (5.8% versus 3.3% in long term prophylaxis) it was statistically insignificant ($p = 0.54$). Targeted antibiotic therapy was administered to all affected patients after urine culture and sensitivity testing. These observed results seemd like those of Ijarotimi et al. [7], who reported UTI rates of 6% and 4% in their respective short- and long-course groups ($p = 0.196$).

A combined deep wound infection, and endometritis occurred only in one patient in each group (0.8%) that was statistically insignificant ($p = 1.00$).

Although; the present study was not designed as a formal non-inferiority or equivalence trial, our results were consistent with the current international guideline recommendations from the WHO, ACOG, and RCOG supporting the use of a single-dose or short-course broad-spectrum prophylactic antibiotic, findings by Adaji et al. [10], finding by Ezeike et al. [8], and a review by Lazzaro et al. [15].

Limitations:

The low number of infectious events limits the strength of inference, and the findings are primarily generalizable to the narrowly defined low-risk population studied. Blinding of outcome assessors was not reported.

Conclusions and Recommendations:

As the long-term antibiotic prophylaxis regimen administration perioperative and post elective Cesarean section deliveries in low-risk pregnancies lacks a significant advantage over the short-term antibiotic prophylaxis in preventing post operative morbidities, we recommended the short-course antibiotic perioperative prophylaxis as a standard practice.

Conflict of Interest:

The authors declare that they have no competing interest.

Financial Disclosures:

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Availability of the data:

The datasets generated and/or analyzed during the current study are available from the corresponding author on reasonable request.

Authors contribution:

A.A. and T.A. were responsible for data collection and analysis, and N.M. was responsible for writing and preparation of the manuscript for publication.

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