

A Comparative Study of the Effectiveness of Prophylactic Antibiotics With or Without Additional Post-op Antibiotics Administration in Cesarean Section Patients for Prevention of Post-op Infection in a Private Hospital

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Abstract

OBJECTIVES: To assess the effectiveness of prophylactic antibiotics with or without additional post-op antibiotics on infectious complications in women undergoing cesarean section.

MATERIALS AND METHODS: Retrospective chart review of cesarean section patients at Bangkok Hospital Chiang Mai between 1 January 2016 to 31 December 2018 was carried out. Women at 37-42 weeks' gestational age who underwent cesarean section and received prophylactic antibiotics with or without additional post-op antibiotic administration were reviewed. They were divided into 2 groups: those who received post-delivery antibiotic vs those who did not. To compare post cesarean delivery infection rate from the delivery day until 6 weeks after. The primary end point is post cesarean section infection from delivery to 6 weeks' post-operative

RESULTS: 481 women received prophylactic antibiotic prior to delivery by cesarean section. 46 were excluded 32 due to being less than 37 weeks' gestational age, 3 received antibiotics a week prior to delivery, 11 with history of allergic reaction to penicillin or cephalosporin. So, only 435 women met these research study criteria. Within these, 170 cases (39.1%) received additional antibiotics after cesarean delivery, 265 cases (60.9%) didn't receive antibiotics after cesarean delivery. 20% of prophylactic antibiotic patients only spent more than 60 minutes in the operation room, while 55.29% of those with additional antibiotic post-op did so. 4 (2.4%) cases of additional antibiotic post-op group had post-delivery infection. While 2 (0.8%) cases of patient without additional post-op antibiotic developed infection.

CONCLUSION: Additional post-op antibiotics didn't decrease the incidence of post-delivery infections.

Keywords: Prophylactic antibiotic, Cesarean section, Postpartum infections

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A postpartum infection is also known as an infection developed after vaginal deliveries or cesarean section (C-section) deliveries which can occur after childbirth up to six weeks. Most postpartum infections are caused by bacteria. Postpartum infections also include uterine-peritoneal infections (endometritis), episiotomy infection during vaginal birth, surgical site infections after a cesarean section and urinary tract infection¹

Postpartum infection is one of the top five causes of maternal deaths worldwide and accounts for 10 to 15% of deaths in the postpartum period. Common predisposing factors leading to postpartum infection included poor postpartum hygiene, low socioeconomic status, duration of labor, duration of rupture of membranes, and number of vaginal examinations.²

A cesarean section is generally a very safe procedure for mother and child, but it also carries a higher risk of complications than a vaginal delivery. The study of Bailit JL, et al.,³ conducted on 2,531 postpartum mothers reported that the infection rate of vacuum-assisted vaginal delivery was 0.2%, the infection rate of forceps-assisted vaginal delivery was 0.9% and the infection rate of cesarean section was 5.3%. Preventive measures to reduce possible risks of postpartum infection include: reducing unnecessary cesarean sections, reducing risk factors for infection and administering antibiotics before cesarean section procedure.¹

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In Thailand, the study conducted in 2002 in university hospitals revealed that 74% of postpartum women with cesarean sections received antibiotics and 99.2% of them were given 2 grams of Ampicillin by intravenous administration but their postpartum infection data were not gathered.⁴

World Health Organization (WHO) recommends prophylactic antibiotics for women undergoing cesarean section indicating that prophylactic antibiotics should be given 30-60 minutes prior to skin incision. They noted that first-generation cephalosporin by an intravenous injection is the preferred antibiotic class.¹ However, in general practice, prophylactic antibiotics administration after cesarean section depended on the order of each physician.

Therefore, the investigator was interested to study the benefits of prophylactic antibiotics administration after cesarean section. The study was designed to compare postpartum infection rate in cesarean section women who did or did not receive prophylactic antibiotics administration after cesarean section. The outcome would reveal the value of prophylactic antibiotics administration after cesarean section for preventing risk of postpartum infection. The study could be applied as a guideline for appropriate prophylactic antibiotics administration in women after cesarean section.

Materials and Methods

The proportion of postpartum infection among women who underwent cesarean section and received antibiotics was 9.5%, while the proportion among those who received a placebo was 30.2%.⁵ The sample size was determined by comparing two independent proportions with a power of 90% and a significant level of 0.05.⁶⁻⁸ The sample size was calculated to be 86 cases per group, resulting in a total of 435 pregnant women meeting the criteria for the study.

Women with cesarean section in Bangkok Hospital Chiang Mai between 1st January 2016 to 31st December 2018 were selected.

The inclusion criteria included:

1. Women with cesarean section at term (37-42 weeks).
2. Pregnant women who received prophylactic antibiotics before cesarean delivery.

The exclusion criteria included:

1. Pregnant women who received antibiotics for treatment of infection within 1 week before cesarean section.
2. Pregnant women with a history of penicillin or cephalosporin allergy.

The medical records of patients that met the inclusion criteria were gathered for studying and the data were recorded in data sheet and analyzed by STATA version 15. The data compared the postpartum infection rate in women who received prophylactic antibiotics administration after cesarean section and in women who did not receive antibiotics. The analysis used the proportion test and the odds ratio test of the postpartum

infection rate. The types and frequency of postpartum infection were analyzed by descriptive statistics including frequency and percentage separated into the groups.

This study was approved for ethical review by the Institution Review Board of Bangkok Hospital Chiang Mai (Project Reference: BCM-IRB-2019-09-003) and the use of information from medical records was also approved.

Results

Of a total of 569 pregnant women delivering at Bangkok Hospital Chiang Mai during this period, 481 underwent caesarean section. All of the patients received antibiotics before undergoing procedures, except 32 pregnant women with a gestation age of less than 37 weeks, 3 pregnant women who received antibiotics 1 week before undergoing procedures, 11 pregnant women with a history of penicillin or cephalosporin allergy were excluded from the study. 435 pregnant women met the study criteria and were divided into 170 cases (39.1%) who received post-delivery antibiotics (Group A) and 265 cases (60.9%) without post-delivery antibiotics (Group B).

Table 1 shows most pregnant women with cesarean section were between 31 to 40 years of age. The most frequent indication for cesarean delivery was maternal request, 196 cases (45.1%). The top two indications were repeat cesarean section, 141 cases (32.4%). The women who were elective cesarean section patients who received antibiotics after cesarean section, 131 cases (77.7%). That said, 228 cases (86.0%) did not receive prophylactic antibiotics administration after cesarean section, were elective cesarean sections. The results were shown to be significantly different ($p = 0.016$). There were 94 cases (55.29%) who received antibiotics after cesarean section where the procedure took longer than 60 minutes. While only 53 cases (20%) did not receive antibiotics after cesarean section where the procedure took longer than 60 minutes. The outcomes of these two groups were significantly different ($p < 0.001$).

Postpartum infection was found in 4 (2.4%) women with antibiotics after cesarean delivery and 2 (0.8%) women without antibiotics after cesarean delivery. Thus, the infections in women with antibiotics after cesarean delivery and in women without antibiotics after cesarean delivery were not significantly different ($p = 0.215$) as exhibited in Table 2.

There were 2 cases of women with cesarean delivery where the procedure took longer than 60 minutes who developed infections and received antibiotics after procedure and there were no infection cases who did not receive antibiotics after procedure. There was no statistically significant difference between groups as exhibited in Table 2.

Postpartum infections among women who underwent cesarean section and received antibiotics included: wound infection, urinary tract infections, endometritis and fever while the postpartum infections among those who did not receive antibiotics included urinary tract infections and endometritis, as exhibited in Table 3.

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Table 1: Subjects' characteristics (n = 435)

Characteristics	Received antibiotics (n = 170) Group A	Did not receive antibiotics (n = 265) Group B	p
Age (years)			0.851
< 21	1 (0.6)	4 (1.5)	
21-30	73 (42.9)	110 (41.5)	
31-40	93 (54.7)	144 (54.3)	
> 40	3 (1.8)	7 (2.6)	
Gravida			0.711
Primigravida	82 (48.2)	123 (46.4)	
Multigravida	88 (51.8)	142 (53.6)	
Gestational age > 37 Wks.	170 (100.0)	265 (100.0)	
Type			0.016*
Elective cesarean section	131 (77.1)	228 (86.0)	
Normal delivery converts to cesarean section	39 (22.9)	37 (14.0)	
Indications for cesarean section			0.516
Previous cesarean section	54 (31.8)	87 (32.8)	
Maternal request	79 (46.5)	117 (44.2)	
Cephalopelvic disproportion	20 (11.8)	30 (11.3)	
Breech presentation	5 (2.9)	4 (1.5)	
Placenta previa	3 (1.8)	4 (1.5)	
Fetal distress	1 (0.6)	4 (1.5)	
Large fetus	0 (0.0)	7 (2.6)	
Severe pre-eclampsia	1 (0.6)	1 (0.4)	
Twins pregnancy	0 (0.0)	2 (0.8)	
Others	7 (4.1)	9 (3.4)	
Duration of labor (hours)			0.14
0	90 (52.9)	163 (61.5)	
1-12	79 (46.5)	101 (38.1)	
> 12	1 (0.6)	1 (0.4)	
Duration of ruptured membranes (hours)			0.861
0	134 (78.8)	207 (78.1)	
1-12	36 (21.2)	58 (21.9)	
> 12	0 (0.0)	0 (0.0)	
Number of vaginal examinations			0.055
0	121 (71.2)	210 (79.2)	
1-5	48 (28.2)	55 (20.8)	
> 5	1 (0.6)	0 (0.0)	
Duration of surgery (minutes)			< 0.001*
< 60	76 (44.7)	212 (80.0)	
60-90	84 (49.4)	51 (19.2)	
> 90	10 (5.9)	2 (0.8)	

Table 2: Percentage of postpartum infections

Cesarean section	n	Percentage of postpartum infections		p
		Received antibiotics (n = 170)	Did not receive antibiotics (n = 265)	
Total	435	4 (2.4)	2 (0.8)	0.215
Duration of surgery				
< 60 minutes	288	2 (2.6)	2 (0.9)	0.285
≥ 60 minutes	147	2 (2.3)	0 (0)	0.536

Table 3: Type of postpartum infections

Received antibiotics after cesarean section	Type of postpartum infections				p
	Wound infections	Urinary tract infections	Endometritis	Fever	
Yes (n = 4)	1 (25.0)	1 (25.0)	1 (25.0)	1 (25.0)	1.000
No (n = 2)	0 (0)	1 (50.0)	1 (50.0)	0 (0)	

Discussion

Women undergoing cesarean section are at increased risk of postpartum infections. Potential risk factors for developing postpartum infections included multigravida, indications of cesarean section, duration of labor, duration of rupture of membranes, number of vaginal examinations and duration of surgery. The outcome was relevant to the study of Prawit Wannaro, et al.,⁹ which revealed surgeon and duration of surgery to be significantly related to postpartum infections.

This study showed that women who received antibiotics after cesarean section had developed postpartum infections more than women who did not receive antibiotics after cesarean section but this data showed no statistically significant difference between groups.

The outcome of this study showed that obstetricians tended to give antibiotics to woman who underwent cesarean procedure for longer than 60 minutes. However, the postpartum infections of the group of women who underwent cesarean procedure for longer than 60 minutes and received antibiotics after the procedure and the group of women who underwent cesarean procedure for longer than 60 minutes and did not receive antibiotics after the procedure were not different. Nevertheless, the total number of cases of women who underwent cesarean procedure for longer than 60 minutes and received antibiotics after the procedure were 94 whereas the total number of cases of women who underwent cesarean procedure for longer than 60 minutes and did not receive antibiotics after the procedure were 53. Number of cases of both groups were significantly different ($p > 0.001$). Thus, the study of the postpartum infections in women who underwent cesarean procedure for longer than 60 minutes, divided into the group that received antibiotics after the procedure and the group that did not receive antibiotics should be further

extended. A larger sample size is needed for both groups in order to obtain more valid findings.

Being a retrospective study, this study has limitation of data completeness. Any further study should include other risk factors associated with postpartum infections such as anemia, body mass index (BMI), pre-operation underlying diseases for example gestational diabetes mellitus, etc., to determine possible risk factors associated with the development of infections: for example vacuum extraction, forceps delivery, etc. This study was conducted based on the data from a single private hospital so the sample size may be too small. To improve the validity of findings, a larger sample size is needed.

Conclusion

The rate of postpartum infections in the group of women with cesarean section who received antibiotics after the procedure and the group of women with cesarean section who did not receive antibiotics after the procedure was not different. The findings reinforced the benefit of the administration of prophylactic antibiotics in cesarean section patients. However, other risk factors associated with infection in each individual pregnant woman should also be considered.

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