
OBSTETRICS

The Incidence and Associated Factors of Perineal Wound Infection Following Vaginal Delivery in Charoenkrung Pracharak Hospital, Bangkok, Thailand

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ABSTRACT

Objectives: To measure the incidence and assess the associated factors for perineal wound infection and dehiscence following vaginal delivery.

Materials and Methods: This retrospective study was conducted between October 2018 and September 2020 in Charoenkrung Pracharak Hospital. The incidence of perineal wound infection and dehiscence was calculated. There were 4,015 delivered vaginally. A total of 2,589 pregnant women were enrolled. The data collection tools included postpartum ward daybook, electronic patient records, and clinical data of perineal wound examination at first 72 hours after delivered was reviewed. The association factors were analyzed by logistic regression.

Results: The incidence of perineal wound morbidity was 2.9% (1.7% of wound infection and 1.2% of wound dehiscence). Gestational hypertension (adjusted odds ratio (aOR) 3.77, 95% confidence interval (CI) 1.28-11.12), number of vaginal examinations > 4 (aOR 4.21, 95%CI 2.29-7.73), neonatal birth weight \geq 3 kg (aOR 4.28, 95%CI 1.89-9.7) and registered nurse with less than 5 years of experience (cOR 3.04, 95 % CI 1.46-6.35) increased the risk of wound infection. Prophylactic antibiotic reduced the risk of perineal wound infection (aOR 0.29, 95%CI 0.1-0.82). There was no significantly associated risk factor for perineal wound dehiscence.

Conclusion: Perineal wound morbidity was found to be 2.9% with 1.7% of perineal infection and 1.2% of perineal dehiscence. The number of vaginal examinations > 4, neonatal birth weight \geq 3,000 grams, gestational hypertension, and healthcare providers with experience < 5 years increased the risk of perineal wound infection. Prophylactic antibiotics reduced the incidence of infected perineal wounds.

Keywords: perineal wound, infection, dehiscence.

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อุบัติการณ์ และปัจจัยที่มีความสัมพันธ์กับการติดเชื้อแผลฝีเย็บหลังคลอดในหญิงตั้งครรภ์ที่คลอดบุตรทางช่องคลอดในโรงพยาบาลเจริญกรุงประชารักษ์

นันทวัฒน์ ทองทิพย์, อังสุมาลิน ศรีหาล้า, จิรพร เหลืองเมตตากุล

บทคัดย่อ

วัตถุประสงค์: เพื่อศึกษาอุบัติการณ์และปัจจัยที่มีความสัมพันธ์กับการติดเชื้อแผลฝีเย็บและการเกิดแผลฝีเย็บแยกหลังคลอดในหญิงตั้งครรภ์ที่คลอดบุตรทางช่องคลอด

วัสดุและวิธีการ: การศึกษาย้อนหลังในช่วงเดือนตุลาคม พ.ศ.2561 จนถึงเดือนกันยายน พ.ศ.2563 โดยศึกษาอุบัติการณ์แผลฝีเย็บติดเชื้อ และแผลแยกในหญิงตั้งครรภ์ที่คลอดบุตรทางช่องคลอดที่โรงพยาบาลเจริญกรุง-ประชารักษ์ ทั้งหมด 4,015 คน โดยสุ่มกลุ่มตัวอย่างจำนวน 2,589 คน ซึ่งคลอดบุตรทางช่องคลอดและเย็บแผลฝีเย็บ โดยเก็บข้อมูลย้อนหลังจากสมุดตรวจแผลประจำวันและเวชระเบียน ซึ่งตรวจที่ 72 ชั่วโมงแรก หลังคลอด และนำผลลัพธ์มาเพื่อศึกษาอุบัติการณ์ และวิเคราะห์ปัจจัยที่มีความสัมพันธ์กับการติดเชื้อ และการแยกของแผลฝีเย็บหลังคลอด

ผลการศึกษา: การศึกษาพบว่าเกิดผลแทรกซ้อนของแผลฝีเย็บทั้งหมด ร้อยละ 2.9 โดยเป็นแผลติดเชื้อ ร้อยละ 1.7 และแผลแยก ร้อยละ 1.2 จากการศึกษาพบว่าภาวะความดันโลหิตสูงหลังการตั้งครรภ์ (adjusted odds ratio (aOR) 3.77, 95% confidence interval (CI) 1.28-11.12) จำนวนการตรวจภายในมากกว่า 4 ครั้ง (aOR 4.21, 95%CI 2.29-7.73) น้ำหนักทารกแรกเกิด ≥ 3 กิโลกรัม (aOR 4.28, 95%CI 1.89-9.7) และพยาบาลวิชาชีพที่มีประสบการณ์การทำคลอด < 5 ปี (cOR 3.04, 95 % CI 1.46-6.35) เป็นปัจจัยที่เพิ่มการเกิดแผลฝีเย็บติดเชื้อ และพบว่าการใช้ยาปฏิชีวนะเพื่อป้องกันการติดเชื้อเป็นปัจจัยที่ลดการเกิดแผลฝีเย็บติดเชื้อ (aOR 0.29, 95%CI 0.1-0.82) สำหรับแผลฝีเย็บแยกนั้นพบว่าไม่มีปัจจัยที่มีความสัมพันธ์อย่างมีนัยสำคัญทางสถิติ

สรุป: การศึกษาพบว่าอุบัติการณ์เกิดผลแทรกซ้อนของแผลฝีเย็บทั้งหมด ร้อยละ 2.9 โดยอุบัติการณ์ของแผลฝีเย็บติดเชื้อ ร้อยละ 1.7 และอุบัติการณ์ของแผลฝีเย็บแยก ร้อยละ 1.2 โดยปัจจัยที่มีความสัมพันธ์กับการเกิดแผลฝีเย็บติดเชื้ออย่างมีนัยสำคัญทางสถิติ คือ ภาวะความดันสูงจากการตั้งครรภ์ จำนวนการตรวจภายใน > 4 ครั้ง น้ำหนักทารกแรกเกิด ≥ 3 กิโลกรัม และประสบการณ์ผู้ทำคลอด < 5 ปี ส่วนการใช้ยาปฏิชีวนะสามารถป้องกันการติดเชื้อแผลฝีเย็บได้อย่างมีนัยสำคัญทางสถิติ

คำสำคัญ: แผลฝีเย็บ, ติดเชื้อ, แผลแยก

Introduction

Perineal wound infection and dehiscence usually occur in the first 72 hours-14 days of delivery and are associated with physical, mental, and future sexual problems to postpartum mothers. The perineal wound also causes pain, incontinence, and dyspareunia owing to inflammation⁽¹⁾. The key factors causing the infected perineal wound are: (1) maternal factors associated with diseases, diabetes, primiparity, advanced maternal age, weight, education, and ethnicity, (2) fetal factor: baby birth weight (> 4000 g), and (3) delivery factors: operative vaginal delivery, perineal incision episiotomy, and degree of perineal tear. Buppasiri et al compared spontaneous laceration, restrictive episiotomy, and routine episiotomy and found that episiotomy could reduce the severity of the perineal wound and its complications since third and fourth-degree perineal lacerations were associated with an elevated perineal wound infection risk⁽²⁾. Other factors linked to perineal wound infection include postpartum hemorrhage. In addition, the risk of infection and antibiotic exposure could be increased during second stage labor⁽³⁻⁵⁾.

In obstetrics, the perineal repair is considered as a crucial surgical procedure, an approximately 85% of pregnant women with vaginal delivery had perineal injuries, including spontaneous laceration and episiotomy^(6, 7). Perineal lacerations cause a variety of problems for postpartum mothers⁽⁸⁾; the most common risk of perineal wound is the infection of the perineal wound⁽⁹⁾. A study conducted by a systematic review revealed that perineal wound infection ranged from 0.1 to 23.6%, and perineal wound dehiscence was from 0.21% to 24.6%⁽⁹⁾, based on the regional and ethnic differences. Perineal wound infection ranged from 0.2% to 3.96% in Thailand by some studies⁽¹⁰⁻¹²⁾. However, some studies found that wound infection was as high as 20.7% in Bangkok⁽³⁾.

The Charoenkrung Pracharak Hospital is a 464-bed advanced tertiary hospital in Bangkok. In 2019, the hospital received a transfer from other hospitals to provide maternity services, and the hospital recorded a total of 3,053 births with 1,930 vaginal deliveries in the same year. The records were kept in the hospital

database, comprised of incidents and related factors to avert difficulties and after-birth impacts on postpartum mothers. Typically, the delivery has an impact on mental health, customers' satisfaction, service quality, hospital revenue loss, and costs of maternity care after childbirth, especially increased hospital costs and longer hospital stays.

The present study aimed to investigate the incidence of perineal wound infection and dehiscence and to determine the factors associated with postpartum perineal wound infection.

Materials and Methods

This retrospective cross-sectional study was conducted between October 2018 and September 2020 in Charoenkrung Pracharak Hospital, Bangkok, Thailand. The study protocol was approved by the Bangkok Metropolitan Administration Human Research Ethics Committee and conducted to investigate the health status of pregnant women delivered in Charoenkrung Pracharak Hospital. The sample size was calculated based on available literature. Kiennukul et al identified a 3.96% incidence of perineal wound infection, using a 95% confidence level and 10% data loss. A total of 2,589 vaginal deliveries with perineal wound repair were included from sample size calculation. Excluded criteria were pregnant women who had vaginal deliveries with no perineal tear, those with gestational age < 28 weeks, birth weight < 1,000 grams, and those with incomplete medical records.

The evidence of perineal wound morbidity was identified in (1) the postpartum ward daybook, recording the perineal wound examination at 24, 48, and 72 hours after delivery and in (2) electronic patient records. According to Jones et al, the perineal wound infection was examined from the first 24 hours to 28 days after childbirth, with the highest infectious inflammation in the first 72 hours^(9, 16-18). Thus, our hospital follows this guideline, requiring the doctors and nurses to assess perineal wounds at 24, 48, and 72 hours after birth. Therefore, we used the perineal wound examination at the first 72 hours after delivery to identify the perineal wound morbidity.

Perineal wound infections were diagnosed in our hospital following the presence of purulent discharge and positive bacterial culture. We defined perineal wound dehiscence as a gap of > 1 cm between wound edges. In this study, the diagnosis of the perineal wound was defined following the Center for Disease Control (CDC) guidelines, as either the presence of purulent discharge or a wound abscess (pain, swelling, redness)⁽¹³⁾. The perineal wound dehiscence was defined as a gap of > 1 cm between wound edges^(14, 15). Perineal wound morbidity was defined as perineal wound infection and dehiscence.

We collected the demographic data of patients, potential associated factors resulting in perineal morbidity in the antepartum and intrapartum period, the degree of perineal wound tear, and the health care providers who repaired perineal wounds in labor. We also collected data related to prophylactic antibiotics used by the patients. The prophylactic antibiotic was defined as the administration of antibiotics after vaginal delivery with the perineal tear, administered to prevent infection. In our hospital, we administered prophylactic antibiotics following the third- or a fourth-degree perineal tear, after operative vaginal deliveries, severe perineal trauma, prolonged procedure (more than 1 hour), obese pregnancy, vaginally delivered by a medical student, and postpartum hemorrhage. The regimen of prophylactic antibiotic comprised of single-dose second-generation cephalosporin intravenously (cefoxitin 1 g intravenously, or clindamycin 900 mg intravenously if allergic to penicillin) for third- or fourth-degree tear, and the oral regimen: clindamycin or amoxicillin for other indications. Perineal trauma: injuries to the vagina, its management, and microbiology results were recorded in the postpartum daybook.

In this study, the primary outcome was the incidence of perineal wound infection. The secondary outcomes were the incidence of perineal wound dehiscence and the associated risk factors of perineal wound morbidity. Descriptive statistics were used to summarize the data in a manageable form in frequencies, percentages, mean, and standard deviation using IBM SPSS version 26. The regression analysis was used to analyze the associated risk factors with estimated

odds ratios (OR) and 95% confidence intervals (CI). A p values < 0.05 was considered statistically significant level. Multiple logistic regression analysis was used to select the associated factors that were statistically significant and to select category variables significant level < 0.2.

Results

Between October 2018 and September 2020, a total of 6,353 pregnant women had childbirth deliveries at Charoenkrung Pracharak Hospital. Of 6,353 pregnant women, a total of 2,338 were cesarean delivery (36.8%) and 4,015 were vaginal delivery (63.2%). We excluded 133 (3.3%) pregnant women who had undergone vaginal delivery without a perineal wound. From those who had undergone vaginal delivery with perineal wound repair, we collected the pregnant women who met the inclusion and no exclusion criteria from the medical record chart consecutively until we collected 2,589 women according to sample size calculation. Of these, episiotomy was performed in 2,219 (85.7%) women. From the group of all women with perineal wound repair, 75 of 2,589 women (2.9%) had perineal wound morbidity, 44 of 2,589 women (1.7%) had perineal wound infection, and 31 of 2,589 women (1.2%) had perineal wound dehiscence.

As revealed in Table 1, the average age of pregnant women was 26.96 ± 6.37 years. We found the greatest number of perineal wound morbidity in women aged 20-34 years old. Nulliparous pregnancy accounted for 17.3% of perineal wound morbidity, to be similar to the incidence in multiparous pregnancy. Thai pregnant women made up the majority of the population in this study and comprised a higher number of women with perineal wound morbidity (77.3% vs 22.7% of non-Thai ethnicity). However, the incidence of perineal wound morbidity increased in non-Thai ethnicity. Most of the pregnant women were secondary school graduation, and the incidence of perineal wound morbidity was highest in women with under primary school education. The mean BMI was 20.94 ± 2.96 kg/m², and this study showed the highest number of perineal wound morbidity was reported in the women with normal BMI (82.7%). The average infant weight

was 3,054.24 ± 419.42 grams, and the greatest number of perineal wound morbidity was found in women who

had a neonatal birth weight between 3,000 and 3,499 grams.

Table 1. Characteristics and incidence of perineal wound morbidity.

Characteristics (mean ± SD)	No morbidity n (%)	Morbidity n (%) n = 75 (2.9)	Incidence of morbidity	Infection n (%) n = 44 (1.7)	Dehiscence n (%) n = 31 (1.2)
Age (years) (26.96 ± 6.37)					
< 20	309 (12.4)	6 (8)	1.9	2 (4.5)	4 (12.9)
20 - 34	1826 (72.6)	61 (81.4)	3.3	37 (84)	24 (77.4)
≥ 35	379 (15)	8 (10.6)	2.1	5 (11.5)	3 (9.7)
Parity					
Primipara	424 (16.9)	13 (17.3)	3.0	8 (18.2)	5 (16.1)
Multipara	2090 (83.1)	62 (82.7)	2.9	36 (81.8)	26 (83.9)
Ethnicity					
Thai	2101 (83.6)	58 (77.3)	2.7	35 (79.5)	23 (74.2)
Non-Thai	413 (16.4)	17 (22.7)	4.1	9 (20.5)	8 (25.8)
Education					
Under primary	134 (5.3)	9 (12)	6.7	5 (11.4)	4 (12.9)
Primary	473 (18.8)	17 (22.7)	3.5	6 (13.6)	11 (35.5)
Secondary	1503 (59.8)	37 (49.3)	2.4	25 (56.8)	12 (38.7)
≥ Bachelor	404 (16.1)	12 (16)	2.9	8 (18.2)	4 (12.9)
BMI (kg/m ²) (20.94 ± 2.96)					
< 18.5	221 (8.8)	5 (6.7)	2.2	1 (2.3)	4 (12.9)
18.5 - 24.9	2037 (81)	62 (82.6)	3.0	37 (84.1)	25 (80.7)
25 - 29.9	204 (8.1)	6 (8)	2.9	5 (11.4)	1 (3.2)
≥ 30	52 (2.1)	2 (2.7)	3.8	1 (2.2)	1 (3.2)
Baby birthweight (grams) (3,054.24 ± 419.42)					
< 2,500	203 (8.1)	4 (5.3)	1.9	1 (2.3)	3 (9.7)
2,500 - 2,999	893 (35.5)	16 (21.3)	1.7	6 (13.6)	10 (32.3)
3,000 - 3,499	1078 (42.9)	44 (58.7)	4.0	29 (65.9)	15 (48.3)
3,500 - 3,999	311 (12.3)	9 (12)	2.8	7 (15.9)	2 (6.5)
≥ 4,000	29 (1.2)	2 (2.7)	6.8	1 (2.2)	1 (3.2)

SD: standard deviation, BMI: body mass index

Table 2 displays the univariate regression analysis for the associated factors for perineal wound infection and perineal wound dehiscence. We found significantly higher incidence of perineal wound infection in pregnant women with the number of vaginal examinations were more than 4 times (OR 3.78, 95%CI 2.08 - 6.88), the experience of provider < 5 years (OR

3.04, 95%CI 1.46 - 6.35), neonatal birthweight ≥ 3,000 gm (OR 4.08, 95%CI 1.81 - 9.19). In contrast, prophylactic antibiotics reduced the incidence of infected perineal wounds (OR 0.37, 95%CI 0.13-1.05).

Our study demonstrated significantly increased risk of perineal wound dehiscence in the experience of the provider less than 5 years (OR 5.6, 95%CI 2.25

-13.96), pregnancy who graduated primary school (OR 2.92, 95%CI 1.28-6.67), and pregnant women

who not graduated primary school (OR 3.66, 95%CI 1.17-11.51).

Table 2. Univariate regression analysis for associated risk factors for perineal wound infection and perineal wound dehiscence.

	(n = 2589) n (%)	Infection n (%) n = 44	Crude OR (95%CI)	Dehiscence n (%) n = 31	Crude OR (95%CI)
Age (years)					
< 20	315 (12.2)	2 (4.5)	0.31 (0.77-1.33)	4 (12.9)	0.99 (0.34-2.89)
20 - 34	1887 (72.9)	37 (84.1)	1	24 (77.4)	1
≥ 35	387 (14.9)	5 (11.4)	0.65 (0.25-1.67)	3 (9.7)	0.60 (0.18-2.02)
Ethnicity					
Non-Thai	430 (16.6)	9 (20.5)	1.29 (0.69-2.719)	8 (26.8)	1.76 (0.78-3.96)
Education					
Under primary	143 (5.5)	5 (11.4)	2.2 (0.83-5.83)	4 (12.9)	3.66 (1.17-11.51)
primary	490 (18.9)	6 (13.6)	0.75 (0.31-1.84)	11 (35.5)	2.92 (1.28-6.67)
secondary	1540 (59.5)	25 (56.8)	1	12 (38.7)	1
≥ bachelor	416 (16.1)	8 (18.2)	1.19 (0.54-2.67)	4 (12.9)	1.24 (0.4-3.87)
Associated disease					
Diabetes mellitus	245 (9.5)	3 (6.8)	0.7 (0.21-2.27)	2 (6.5)	0.66 (0.16-2.77)
Hypertension	207 (8)	5 (11.4)	1.49 (0.58-3.82)	3 (9.7)	1.24 (0.37-4.1)
Gestational HT	93 (3.6)	4 (9.1)	2.76 (0.97-7.88)	1 (3.2)	0.89 (0.12-6.62)
Pre-eclampsia	73 (2.8)	1 (2.3)	0.8 (0.11-5.88)	2 (6.5)	2.42 (0.56-10.32)
Anemia	101 (3.9)	2 (4.5)	1.18 (0.28-4.93)	-	-
Substance abuse (amphetamine)	44 (1.7)	-	-	2 (6.5)	4 (0.92-17.31)
Meconium stain	308 (11.9)	5 (11.4)	0.95 (0.37-2.43)	6 (19.4)	1.79 (0.73-4.41)
Vaginal examination > 4 times	595 (23)	23 (52.3)	3.78 (2.08-6.88)	9 (29)	1.38 (0.63-3)
Operative delivery	55 (2.1)	2 (4.5)	2.24 (0.53-9.49)	-	-
Episiotomy 3 rd / 4 th degree tear	2220 (85.7)	41 (90.9)	1.67 (0.6-4.71)	28 (90.3)	1.56 (0.41-5.15)
3 rd / 4 th degree tear	43 (1.7)	-	-	-	-
2 nd stage					
< 30min	2084 (90.4)	33 (75)	1	25 (80.6)	1
≥ 30min	505 (19.5)	11 (25)	1.38 (0.7-2.76)	6 (19.4)	0.99 (0.4-2.43)
PPH					
< 500	2404 (92.9)	39 (88.6)	1	31 (100)	-
≥ 500	185 (7.1)	5 (11.4)	1.68 (0.66-4.33)	-	-
Prophylactic antibiotic	543 (21)	4 (9.1)	0.37 (0.13-1.05)	2 (6.5)	0.26 (0.06-1.08)
Baby birthweight					
< 3,000	1116 (43.1)	7 (15.9)	1	13 (41.9)	1
≥ 3,000	1473 (56.9)	37 (84.1)	4.08 (1.81-9.19)	18 (58.1)	1.05 (0.51-2.15)
Provider					
RN < 5 yr	703 (27.1)	21 (47.7)	3.04 (1.46-6.35)	21 (67.6)	5.6 (2.25-13.96)
RN ≥ 5 yr	1098 (42.4)	11 (25)	1	6 (19.4)	1
Nurse student	366 (14.1)	9 (20.5)	2.49 (1.02-6.06)	2 (6.5)	1 (0.2-4.98)
Medical student	219 (8.5)	-	-	2 (6.5)	1.68 (0.34-8.37)
Resident	103 (4)	3 (6.8)	2.97 (0.81-10.8)	-	-
Attending OB/GYN	100 (3.9)	-	-	-	-

OR: odd ratio, CI: confidence interval, HT: hypertension, PPH: postpartum hemorrhage, RN: registered nurse.

Table 3 shows the multivariate regression analysis of the associated risk factors for perineal wound

infection. We found that gestational hypertension (adjusted odds ratio (aOR) 3.77, 95%CI 1.28-11.12) and

number of vaginal examinations more than 4 (aOR 4.21, 95%CI 2.29-7.73) and neonatal birth weight \geq 3,000 grams (aOR 4.28, 95%CI 1.89-9.7) increased the risk

of perineal wound infection. Similarly, using prophylactic antibiotics significantly reduced the risk of infected perineal wounds (aOR 0.29, 95%CI 0.1-0.82).

Table 3. Multivariate regression analysis of the associated risk factors for perineal wound infection.

	(n = 2589) n (%)	Infection n (%) n = 44	Crude OR (95%CI)	Adjusted OR (95%CI)	p value
Gestational HT	93 (3.6)	4 (9.1)	2.76 (0.97-7.88)	3.77 (1.28-11.12)	0.023
Vaginal examination > 4 times	595 (23)	23 (52.3)	3.78 (2.08-6.88)	4.21 (2.29-7.73)	< 0.001
Prophylactic ATB	543 (21)	4 (9.1)	0.37 (0.13-1.05)	0.29 (0.1-0.82)	0.019
Baby Birthweight					< 0.001
< 3,000	1116 (43.1)	7 (15.9)	1	1	
\geq 3,000	1473 (56.9)	37 (84.1)	4.08 (1.81-9.19)	4.28 (1.89-9.7)	
Provider					0.097
RN < 5yr	703 (27.1)	21 (47.7)	3.04 (1.46-6.35)	2.66 (1.26-5.6)	
RN \geq 5yr	1098 (42.4)	11 (25)	1	1	
Nurse student	366 (14.1)	9 (20.5)	2.49 (1.02-6.06)	2.45 (0.99-6.03)	
Medical student	219 (8.5)	-	-	-	
Resident	103 (4)	3 (6.8)	2.97 (0.81-10.8)	3.44 (0.8-14.82)	
Attending OB/GYN	100 (3.9)	-	-	-	

OR: odd ratio, CI: confidence interval, HT: hypertension, ATB: antibiotic, RN: registered nurse, OB: obstetric, GYN: gynecology.

Discussion

A review of the previous studies, the incidence of perineal wound morbidity depended on the ethnicity and region of the country. Worldwide, the incidence of perineal wound infection had been 0.1% to 23.6%, and perineal wound dehiscence had been 0.21% to 24.6%⁽⁹⁾. In Thailand, the incidence of perineal wound infection ranged from 0.2 to 3.96%⁽¹⁰⁻¹²⁾. The incidence reported in this study was consistent with the previous studies, in which incidence of perineal wound morbidity was 2.9%, 1.7% was perineal wound infection and 1.2% was perineal wound dehiscence.

Similarly, from previous studies, the number of vaginal examinations, neonatal birthweight, prophylactic antibiotics, and gestational hypertension were the risk factors associated with the high incidence of perineal wound morbidity. The study of Nell⁽¹⁶⁾ found the frequent vaginal examination \geq 5 increased the risk of the infected perineal wound, which was consistent with present study of which the number of vaginal examinations > 4 significantly increased the risk of perineal wound infection⁽¹⁶⁾. Frequent vaginal examinations may introduce infection during the time

of delivery⁽¹⁷⁾, we considered studying the aseptic technique and indication of vaginal examination in the future.

In this study, the risk of developing perineal wound infection to be associated with neonatal birthweight \geq 3,000 grams, which was consistent with previous studies that also found an association between neonatal birthweight greater than 3,500 grams and perineal wound infection⁽¹⁸⁻²⁰⁾. Because of the physical structure of southeast Asian women, the neonatal birth weight \geq 3,000 grams might cause an extended perineal tear and result in perineal wound infection.

Moreover, health care providers (registered nurse, nurse student, medical student, and resident of OB-GYN) who had experience < 5 years were associated with perineal wound infection. In the same way, previous study discovered by midwives had an increased perineal wound infection risk⁽²¹⁾. Our study found that there was no significant difference in the incidence of perineal wound infection between registered nurses with more than 5 years of experience and attending staff. In the other way, registered nurses with less than 5 years of experience had significantly

higher incidence of perineal wound infection than registered nurses with more than 5 years' experience.

Although no statistically significant correlation factor was found for perineal wound dehiscence, the study discovered that non-Thai pregnant women who might not understand Thai or English language and pregnant women who did not graduate from secondary school had a high incidence of perineal dehiscence which was consistent with previous study conducted in Thailand⁽³⁾. Difficulties in communication, which hindered teaching of postpartum perineal wound care were associated with these problems.

In this study, we demonstrated that prophylactic antibiotics significantly reduced the risk of perineal wound morbidity. However, there is no sufficient evidence to assess the clinical benefits or harms of routine antibiotic prophylaxis for episiotomy repair after vaginal delivery. Knight et al⁽²²⁾ also discovered that prophylactic antibiotics reduced the incidence of perineal wound infection in operative vaginal delivery. Moreover, previous studies found that prophylactic antibiotics also reduced infection in the first-degree and second-degree perineal tear, however, no sufficient evidence to support this assertion⁽²²⁻²⁴⁾. The present study discovered no association between perineal wound infection and the performance of operative vaginal delivery, third or fourth-degree perineal tear, and postpartum hemorrhage, which was inconsistent with other previous studies^(14, 18, 19). In contrast, our study found that prophylactic antibiotics reduced the risk of perineal wound infection in the second-degree tear. However, there was no sufficient evidence to conclude the correlation between prophylactic antibiotics and associated risk factors.

This study faces some limitations because it was a single center and retrospective study, limited in terms of data diversity, and insufficient medical record data. Furthermore, we only explored medical record in the first 72 hours of hospitalization, so the incidence of perineal wound infection might be lower than it appeared. The strength of our study was that we used the definition of perineal wound infection from the CDC. In addition, the perineal wound examination in this study was only performed by physicians and registered

nurses. The benefits of antibiotic prophylaxis for second-degree perineal tear and other risks are to be determined by the future study.

Conclusion

Perineal wound morbidity was found to be 2.9% with 1.7% perineal infection and 1.2% perineal dehiscence. The number of vaginal examinations > 4, neonatal birth weight \geq 3,000 grams, gestational hypertension, healthcare providers with experience < 5 years increased the risk of perineal wound infection. Prophylactic antibiotics reduced the incidence of infected perineal wounds.

Potential conflicts of interest

The authors declare no conflicts of interest.

References

1. Dudley L, Kettle C, Waterfield J, Ismail KM. Perineal resuturing versus expectant management following vaginal delivery complicated by a dehisced wound (PREVIEW): a nested qualitative study. *BMJ Open* 2017;7:e013008.
2. Buppasiri P, Lumbiganon P, Thinkhamrop J, Thinkhamrop B. Antibiotic prophylaxis for fourth-degree perineal tear during vaginal birth. *Cochrane Database Syst Rev* 2005;19:1-21.
3. Kiennukul N, Khuanped S, Tonkulrat W, Aiumlaor P. Risk factors for episiotomy wound infection of parturients delivered, Nopparatrajathanee Hospital. *J Depart Med Services* 2019;44:144-51.
4. Johnson A, Thakar R, Sultan AH. Obstetric perineal wound infection: is there underreporting? *Br J Nurs* 2012;21:S28-S35.
5. Wang Y, Puangsricharern A. Immediate maternal and neonatal outcomes of forceps and vacuum-assisted deliveries at Rajavithi Hospital. *Thai J Obstet Gynaecol* 2009;17:80-4.
6. McCandlish R, Bowler U, van Asten H, Berridge G, Winter C, Sames L, et al. A randomised controlled trial of care of the perineum during second stage of normal labour. *Br J Obstet Gynaecol* 1998;105:1262-72.
7. Fernando RJ, Williams AA, Adams EJ. The management of third and fourth degree perineal tears. *Green-top Guideline* 2015;29. Accessed 28 Nov 2020. Available from: <https://www.rcog.org.uk/globalassets/documents/guidelines/gtg-29.pdf>
8. Webb S, Sherburn M, Ismail KM. Managing perineal

- trauma after childbirth. *BMJ* 2014; 25;349.
9. Jones K, Webb S, Manresa M, Hodgetts-Morton V, Morris RK. The incidence of wound infection and dehiscence following childbirth-related perineal trauma: A systematic review of the evidence. *Eur J Obstet Gynecol Reprod Biol* 2019;240:1-8.
 10. Woodd SL, Montoya A, Barreix M, Pi L, Calvert C, Rehman AM, et al. Incidence of maternal peripartum infection: A systematic review and meta-analysis. *PLoS Medicine* 2019;16:e1002984.
 11. Keawpangchan P, Uttaraphayorm P, Janjenjob P, Chaisit S. Relations between the timing of birth and obstetric perineal wound infection. *J Nakornping Hospital* 2017;8:15-24.
 12. Kittipongpattana S, Ploipai S, Leesmidt V. Predictive factors of the episiotomy wound inflammation of the deliveries Khlongklung Hospital Kamphaengphet Province, 2007. *J Nursing Sci Naresuan Univ* 2008;2: 79-89.
 13. Horan TC, Andrus M, Dudeck MA. CDC/NHSN surveillance definition of health care-associated infection and criteria for specific types of infections in the acute care setting. *Am J Infect Control* 2008;36: 309-32.
 14. Kindberg S, Stehouwer M, Hvidman L, Henriksen TB. Postpartum perineal repair performed by midwives: a randomised trial comparing two suture techniques leaving the skin unsutured. *BJOG* 2008 ;115:472-9.
 15. Dudley L, Kettle C, Ismail K. Prevalence, pathophysiology and current management of dehisced perineal wounds following childbirth. *Br J Midwifery* 2013;21:160-71.
 16. Tharpe N. Postpregnancy genital tract and wound infections. *J Midwifery Womens Health* 2008;53:236-46.
 17. WHO Recommendations for Augmentation of Labour. Geneva: World Health Organization, 2014:1-57. Accessed 28 Nov 2020. Available from: https://apps.who.int/iris/bitstream/handle/10665/112825/9789241507363_eng.pdf;jsessionid=8422C34897B6D43B8CE0E38038208560?sequence=1
 18. Gommesen D, Nohr EA, Drue HC, Qvist N, Rasch V. Obstetric perineal tears: risk factors, wound infection and dehiscence: a prospective cohort study. *Arch Gynecol Obstet* 2019;300:67-77.
 19. Klankhajhon S. Nursing care for shoulder dystocia. *J Nursing Health Sci* 2013;7:1-11.
 20. Buphasiri P. Shoulder dystocia. *Srinagarind Med J* 2011;26:64-70.
 21. Jallad K, Steele SE, Barber MD. Breakdown of perineal laceration repair after vaginal delivery: a case-control study. *Female Pelvic Med Reconstr Surg* 2016;22:276-279.
 22. Knight M, Chiocchia V, Partlett C, Rivero-Arias O, Hua X, Hinshaw K, et al. Prophylactic antibiotics in the prevention of infection after operative vaginal delivery (ANODE): a multicentre randomised controlled trial. *Lancet* 2019;393:2395-403.
 23. Bonet M, Ota E, Chibueze CE, Oladapo OT. Antibiotic prophylaxis for episiotomy repair following vaginal birth. *Cochrane Database Syst Rev* 2017;11:CD012136.
 24. Van Schalkwyk J, Van Eyk N, Infectious Diseases Committee. Antibiotic prophylaxis in obstetric procedures. *J Obstet Gynaecol Can* 2010;32:878-884.