OBSTETRICS

Risk Factors of Cesarean Delivery due to Cephalopelvic Disproportion in Nulliparous Women at Sisaket Hospital

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ABSTRACT

Objective: To identify the risk factors of cesarean delivery due to cephalopelvic disproportion in nulliparous women.

Materials and Methods: A case-control study was conducted at Sisaket Hospital, North Eastern, Thailand. The study group consisted of nulliparous women who delivered by cesarean section due to cephalopelvic disproportion from May 1, 2010 to April 30, 2011. The control group consisted of nulliparous women who delivered normally during the same period. Maternal age, height, gestational age, pre-pregnancy weight, weight before delivery, total weight gain, BMI, symphysis pubis-fundal height, birth weight, newborn sex and apgar score at 5 minutes < 7 were mainly focused. Risk factors were analyzed and compared between cesarean delivery group and control group. Univariate and multivariate analysis were performed.

Results: The study group consisted of 309 nulliparous women and the control group consisted of 814 nulliparous women. Risk factors significantly associated with cesarean delivery due to cephalopelvic disproportion included maternal height ≤ 154 cm. (OR 2.89, 95%CI 2.12-3.95), total weight gain ≥ 16 kg. (OR 0.51, 95%CI 0.36-0.73), pre-pregnancy BMI >25 kg/m^2 (OR 0.61, 95%CI 0.47-0.80), BMI before delivery >25 kg/m^2 (OR 0.48, 95%CI 0.38-0.60) and symphysis pubis-fundal height ≥ 33 cm. (OR 0.37, 95%CI 0.27-0.5).

Conclusion: Risk factors of cesarean delivery due to cephalopelvic disproportion in nulliparous women were maternal height ≤154 cm., total weight gain ≥ 16 kg., pre-pregnancy BMI >25 kg/m^2, BMI before delivery >25 km/m^2 and symphysis pubis-fundal height ≥ 33 cm. Combination of these risk factors may be used for clinical management and decision-making of laboring the nulliparous women.

Keywords: cesarean delivery, cephalopelvic disproportion, risk factors, nulliparous women.

Introduction

Cesarean delivery is one of the most common major obstetrics operations performed around the world. The cesarean delivery rate continue to increase worldwide because improvement of surgical techniques, innovation, technological development and from maternal request. Overall cesarean delivery rate in worldwide was 25.7%, 35.4% in Latin America, 27.3% in Asia and Africa which shows the lowest rate of 3.5%[1-3]. From 1970 to 2007, the cesarean delivery rate in the United States rose from 4.5% to 31.8% for all deliveries[4]. In Chulalongkorn Memorial Hospital and

Rajavithi Hospital, Thailand, the cesarean section rate was 37.0% in 2007[5] and 25.7% in 2010[6], respectively. In Sisaket Hospital, the cesarean delivery rate increased from 32.7% in 2006 to 35.7% in 2010.

In nulliparous women, cesarean delivery was still increasing because many reasons include the following: women are having fewer children, elderly pregnancy, obesity, legal and cesarean delivery on maternal request (CDMR). Major reason of primary cesarean deliveries were dystocia (cephalopelvic disproportion; CPD). CPD was the most frequent indication for cesarean delivery and may lead to hazardous complication to mother and child if delayed diagnosis. Many studies examined the risk factors associated with the increase in cesarean delivery due to CPD, such as gestational age, maternal height, BMI, total body weight gain, symphysis pubis-fundal height, birth weight, gravidity and parity.

Study of risk factors for cesarean delivery due to CPD in nulliparous women diagnosed by mean of WHO partograph, the criteria of which were guided by the Royal Thai College of Obstetricians and Gynaecologists is needed for early detection of these risk factors before delivery, so that safe delivery can be planed in advance. The objective of this study is to identify the risk factors for cesarean delivery due to CPD in nulliparous women in order to diagnosed easily and refer rapidly.

Material and methods

This study was approved by the Ethics Committee of Sisaket Hospital. The data were collected from medical records of nulliparous women who delivered at Sisaket Hospital from May 1, 2010 to April 30,2011. A case-control study was conducted at labor ward of Sisaket Hospital. Cases were all nulliparous women delivered by cesarean delivery due to cephalopelvic disproportion (n=309) as described by the criteria of The Royal Thai College of Obstetricians and Gynaecologists[7]: 1.) cervical dilatation at least 4 cm. and effacement at least 80% at the time of diagnosis, 2.) regular uterine contraction for at least 2 hours before the time of decision-making, and 3.) abnormal partograph, such as protraction disorders, arrest disorders or second stage disorders. The control group consisted of all nulliparous women (n=814) who had undergone normal delivery around the same time of each study case.

Maternal age, height, gestational age, pre-pregnancy weight, weight before delivery, total weight gain, pre-pregnancy BMI, BMI before delivery, symphysis pubis-fundal height, birth weight, newborn sex and Apgar score at 5 minutes <7 were mainly focused. Information relevant to the interesting factors were obtained from medical records in the inpatient charts and computerized database of the Statistical Unit of Sisaket Hospital.

All analyses were conducted using the SPSS version 11.5. The data were presented as mean, standard deviation (SD) and frequency (%). The chi-square test was used for analyzing the data. The significant factors were analyzed by multivariate logistic analysis and presented as p-value, odds ratio and 95% confidence interval. p-value <0.05 was considered statistically significant.

Results

Demographic data of the study group were shown in Table 1. There were significantly different between the cases and controls in maternal age (24.45 ± 5.46 years vs. 22.45 ± 5.07 years), maternal height (154.94 ± 6.20 cm. vs. 157.64 ± 5.79 cm.), pre-pregnancy weight (51.28 ± 9.49 kg. vs. 49.71 ± 7.54 kg.) and pre-pregnancy BMI (21.32 ± 3.47 kg/m^2. vs. 20.00 ± 2.76 kg/m^2.).

Obstetric characteristics of the study group were presented in Table 2. There were significant difference between cases and controls in gestational age (38.84 ± 1.52 weeks vs. 38.20 ± 1.56 weeks), weight before delivery (68.26 ± 12.63 kg. vs. 64.09 ± 9.75 kg.), total weight gain (16.97 ± 2.57 kg. vs. 14.38 ± 4.57 kg.), BMI before delivery (28.32 ± 4.45 kg/m^2. vs. 25.78 ± 3.57 kg/m^2.) and symphysis pubis-fundal height (33.57 ± 2.60 cm. vs. 31.54 ± 2.72 cm.).

Neonatal outcome of the study group were presented in Table 3. The neonatal birthweight of the cases were significantly larger than those of the control (3,336.76 ± 429.55 grams. vs. 2,943.88 ± 374.35 grams.). The neonatal sex and Apgar score at 5 minutes < 7 were not different between both groups.

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After multivariate, stepwise logistic analysis, maternal height ≤ 154 cm. (OR 2.89, 95%CI 2.12-4.00), total weight gain ≥ 16 kg. (OR 0.51, 95%CI 0.36-0.73), pre-pregnancy BMI >25 kg/m^2 (OR 0.61, 95%CI 0.47-0.80), BMI before delivery >25 kg/m^2 (OR 0.48, 95%CI 0.38-0.60) and symphysis pubis-fundal height ≥ 33 cm. (OR 0.37, 95%CI 0.27-0.50) remained significant risk factors for cesarean delivery due to CPD in nulliparous women as shown in Table 4.

Table 1. Demographic characteristics of the study groups (n=309 cases)

Characteristics	Cesarean delivery (n=309)	Normal delivery (n=814)	p-value
Age (years)			
≤20	83(26.86%)	347(42.63%)	
21-30	181(58.58%)	400(49.14%)	
31-40	43(13.92%)	66(8.11%)	
≥41	2(0.65%)	1(0.12%)	
Mean ± SD	24.45 ± 5.46	22.45 ± 5.07	<0.001
Maternal height (cm.)			
≤154	132(11.75%)	203(18.08%)	
≥155	177(15.76%)	611(54.41%)	
Mean ± SD	154.94 ± 6.20	157.64 ±5.79	<0.001
Pre-pregnancy weight (kg.)			
≤40	28(9.30%)	58(7.18%)	
41-50	132(43.85%)	441(54.58%)	
51-60	113(37.54%)	248(30.69%)	
61-70	21(6.98%)	49(6.06%)	
≥71	7(2.33%)	12(1.49%)	
Mean ± SD	51.28 ± 9.49	49.71 ± 7.54	<0.001
Pre-pregnancy BMI (kg/m^2)			
≤25	274(24.40%)	768(68.39%)	
>25	35(3.12%)	46(4.09%)	
Mean ± SD	21.32 ± 3.47	20.00 ± 2.76	0.001

Table 2. Obstetric characteristic of the study group (n=309 cases)

Characteristics	Cesarean delivery (n=309)	Normal delivery (n=814)	p-value
Gestational age (weeks)			
≤37	32(10.36%)	193(23.71%)	
38-41	272(88.03%)	616(75.68%)	
≥42	5(1.62%)	5(0.61%)	
Mean ± SD	38.84 ± 1.52	38.20 ± 1.56	<0.001
Weight before delivery (kg.)			
41-50	9(2.91%)	43(5.28%)	
51-60	80(25.89%)	294(36.12%)	
61-70	115(37.22%)	297(36.49%)	
71-80	63(20.39%)	129(15.85%)	
≥81	42(13.59%)	51(6.27%)	
Mean ± SD	68.26 ± 12.63	64.09 ± 9.75	<0.001

	Cesarean delivery	Normal delivery	
BMI before delivery (kg/m^2)			
≤25	75(6.68%)	375(33.39%)	
>25	234(20.84%)	439(39.09%)	
Mean ± SD	28.32 ± 4.45	25.78 ± 3.57	<0.001
Total weight gain (kg.)			
≤5.0	1(0.32%)	3(0.37%)	
5.1-10	20(6.47%)	131(16.15%)	
10.1-15.0	113(36.57%)	367(45.25%)	
≥15.1	175(56.63%)	310(38.22%)	
Mean ± SD	16.97 ± 2.57	14.38 ± 4.57	<0.001
Symphysis pubis-fundal height (cm.)			
≤30	40(12.94%)	287(35.26%)	
31-35	203(65.70%)	471(57.86%)	
36-40	65(21.04%)	56(6.88%)	
≥41	1(0.32%)	0(0.00%)	
Mean ± SD	33.57 ± 2.60	31.54 ± 2.72	<0.001

Table 3. Neonatal outcome in the study group (n=309 cases)

Characteristics	Cesarean delivery (n=309)	Normal delivery (n=814)	p-value
Birth weight (grams)			
≤2500	10(3.24%)	87(10.69%)	
2501-3000	61(19.74%)	372(45.70%)	
3001-3500	132(42.72%)	302(37.10%)	
3501-4000	86(27.83%)	52(6.39%)	
4001-4500	18(5.83%)	1(0.12%)	
≥4501	2(0.65%)	0(0.00%)	
Mean ± SD	3336.8 ± 429.6	2943.9 ± 374.4	<0.001
Newborn sex			
male	150(48.5%)	403(49.5%)	0.789
female	159(51.5%)	411(50.5%)	
Apgar score at 5 min.			
≤7	3(1.0%)	10(1.2%)	1.000
>7	306(99.0%)	804(98.8%)	

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Table 4. Risk factors for cesarean delivery due to cephalopelvic disproportion in nulliparous women

Risk factors	Univariate analysis			Multivariate logistic analysis		
	OR	95%CI	p-value	OR	95%CI	p-value
Maternal height ≤ 154 cm.	2.25	1.46-2.96	< 0.001	2.89	2.12-3.95	< 0.001
Pre-pregnancy weight ≥ 51 kg.	0.72	0.55-0.93	< 0.001	0.71	0.48-1.07	0.102
Pre-pregnancy BMI >25 (kg/m^2)	2.13	1.34-3.38	0.001	0.61	0.47-0.80	0.002
Weight before delivery ≥ 68 kg.	0.61	0.46-0.80	< 0.001	1.05	0.65-1.70	0.85
BMI before delivery >25 (kg/m^2)	2.67	1.99-3.58	<0.001	0.48	0.38-0.60	<0.001
Total weight gain≥ 16 kg.	0.42	0.32-0.55	< 0.001	0.51	0.36-0.73	< 0.001
Symphysis pubis-fundal height ≥33 cm.	0.26	0.19-0.36	< 0.001	0.37	0.27-0.50	< 0.001

Discussion

In this study, we evaluated the risk factors for cesarean delivery due to CPD in nulliparous women. From the univariate analysis of demographic characteristic, obstetric characteristic and neonatal outcome, the significant risk factors were maternal age, maternal height, pre-pregnancy weight, gestational age, weight before delivery, total weight gain, symphysis pubis-fundal height and birth weight. After conducting the multivariate logistic analysis in order to exclude confounding factors, the strongest associated risk factors were derived. Finally, five significant risk factors associated with the higher rate of cesarean delivery due to CPD in nulliparous women were maternal height ≤ 154 cm. (OR 2.89, 95%CI 2.12-3.95), total weight gain ≥ 16 kg. (OR 0.51, 95%CI 0.36-0.73), pre-pregnancy BMI >25 kg/m^2 (OR 0.61, 95%CI 0.47-0.80) BMI before delivery >25 kg/m^2 (OR 0.48, 95%CI 0.38-0.60) and symphysis pubis-fundal height ≥ 33 cm. (OR 0.37, 95%CI 0.27-0.50).

The maternal height ≤ 154 cm. in this study was associated with significantly increased risk of cesarean delivery due to CPD. In this study, we found that maternal height ≤ 154 cm. is the strongest factor in our study (OR 2.89, 95%CI 2.12-3.95) (p<0.05). This finding was similar to other studies, for example, the study of Chan BC and Lao TT[8] in Hong Kong showed

maternal height < 153 cm., the study of Khunpradit S et al[9], in Lamphun Hospital, Thailand, showed maternal height < 152 cm. and the study of Oboro VO et. al[10], in Nigeria showed short stature women (<150 cm.) were associated with increased cesarean delivery. This finding was in contrast to other studies that showed maternal height < 155 cm. and short stature women (<150 cm.) were not associated with a greater likelihood of cesarean delivery for CPD(11,12). The various cut-off points of maternal height that associated with increased risk of cesarean delivery have been different because the reasons of genetic factors, nutritional status and general health.

Total weight gain ≥16 kg, pre-pregnancy BMI and BMI before delivery more than 25kg/m^2 increased the risk of cesarean delivery due to CPD when compared with the control group. This finding was similar to many studies(13-17). Usually, maternal weight is recorded at prenatal care visits and weight gain is considered to be a significant clinical finding. As for maternal weight, it has been found that weight before pregnancy, weight before delivery, weight gain during pregnancy, BMI before pregnancy and before delivery >25 kg/m^2 were correlated with birthweight. Weight and BMI before pregnancy were more correlated with pre-pregnancy than pre-delivery period. The pre-pregnancy BMI was selected for analysis instead of the statistically

significant pre-pregnancy weight, because it could better represent the maternal nutritional status and determine the feta size.

Symphysis pubis-fundal height ≥33 cm. on admission of labor room is associated with an increased risk of cesarean delivery due to CPD. Khunpradit S et al[9] in Lamphun Hospital, Thailand reported that symphysis pubis-fundal height greater than 35 cm is strongest indicator for cesarean delivery due to CPD. This finding was different to the study of Surapanthapisit P and Thitadilok W[16] that showed no correlation between the symphysis pubis-fundal height and risk of cesarean delivery. The symphysis pubis-fundal height differed in cut-off points which may due to the different population, number of sample and individual technique to measured the fundal height.

The symphysis pubis-fundal height should be measured as distance over the abdominal wall from the upper border of the symphysis pubis to the top of the fundus. The measurement is easy without expensive equipment or expertise, safe and harmlessly. We suggest this technique should be usually done as an alternative for predicting the risk of cesarean delivery due to CPD.

In this study, the most important risk factors for cesarean delivery due to cephalopelvic disproportion in nulliparous women were maternal height, total weight gain, pre-pregnancy BMI and symphysis pubis-fundal height. Detection of these risk factors, especially during the first stage of labor may help the obstetricians and nurses to plan far close monitoring, prevention of complications and more provide an appropriate care. In the primary hospitals that do not have an obstetrician, doctors and midwifes should be aware of these risk factors, detect and refer to the secondary or tertiary hospital for more appropriated management.

Conclusion

Risk factors of cesarean delivery due to cephalopelvic disproportion in nulliparous women were maternal height ≤154 cm., total weight gain ≥ 16 kg., pre-pregnancy BMI >25 kg/m^2, BMI before delivery >25 kg/m^2 and symphysis pubis-fundal height ≥ 33 cm. Combination of these risk factors may be used for clinical management and decision-making of laboring the nulliparous women.

Acknowledgement

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ปัจจัยเสี่ยงของการผ่าตัดคลอดจากภาวะผิดสัดส่วนระหว่างศีรษะทารกและเชิงกรานในหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตร ที่โรงพยาบาลศรีสะเกษ

วันชัย เวี่ยนวิเศษ

วัตถุประสงค์ : เพื่อหาปัจจัยเสี่ยงของการผ่าตัดคลอดจากภาวะผิดสัดส่วนระหว่างศีรษะทารกและเชิงกรานในหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตร

วัสดุและวิธีการ : การศึกษาแบบมีกลุ่มศึกษาและกลุ่มควบคุม ที่โรงพยาบาลศรีสะเกษ ประเทศไทย กลุ่มศึกษาประกอบด้วยหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตรที่ผ่าตัดคลอดจากภาวะผิดสัดส่วนระหว่างศีรษะทารกและเชิงกรานจากวันที่ 1 พฤษภาคม พ.ศ. 2553 ถึง 30 เมษายน พ.ศ. 2554 กลุ่มควบคุมประกอบด้วยหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตร ที่คลอดปกติในช่วงเวลาเดียวกัน ลักษณะที่ศึกษา ได้แก่ อายุ ความสูง อายุครรภ์ น้ำหนักก่อนตั้งครรภ์ น้ำหนักก่อนคลอดน้ำหนักที่เพิ่มขึ้นขณะตั้งครรภ์ ดัชนีมวลกาย ความสูงของยอดมดลูก น้ำหนักทารกแรกคลอด เพศของทารก และคะแนนแอปการ์ที่ 5 นาที ที่น้อยกว่า 7 ปัจจัยเสี่ยงทั้งหมดจะนำมาวิเคราะห์ทางสถิติและเปรียบเทียบกันระหว่างทั้ง 2 กลุ่ม โดยใช้การวิเคราะห์แบบ univariate และ multivariate

ผลการศึกษา : กลุ่มที่ศึกษาประกอบด้วยหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตรจำนวน 309 รายและกลุ่มควบคุมจำนวน 814 ราย ปัจจัยเสี่ยงสำหรับการผ่าตัดคลอดจากภาวะผิดสัดส่วนระหว่างศีรษะทารกและเชิงกรานที่พบว่ามีนัยสำคัญ คือ คือความสูงของมารดาที่เท่ากับ หรือน้อยกว่า 154 เซนติเมตร (OR 2.89, 95%CI 2.12-3.95) น้ำหนักที่เพิ่มขึ้นขณะตั้งครรภ์ตั้งแต่ 16 กิโลกรัม ขึ้นไป (OR 0.51, 95%CI 0.36-0.73) ดัชนีมวลกายก่อนการตั้งครรภ์ที่มากกว่า 25 กก./ม.^{2} (OR 0.61, 95%CI 0.47-0.80) ดัชนีมวลกายก่อนคลอดที่มากกว่า 25 กก/ม^2 (OR 0.48, 95%CI 0.38-0.60) และความสูงระหว่างกระดูกหัวหน่าวถึงยอดมดลูกตั้งแต่ 33 เซนติเมตรขึ้นไป (OR 0.37, 95%CI 0.27-0.50)

สรุป : ปัจจัยเสี่ยงสำหรับการผ่าตัดคลอดจากภาวะผิดสัดส่วนระหว่างศีรษะทารกและเชิงกรานที่พบว่ามีนัยสำคัญ คือความสูงของมารดาที่เท่ากับ หรือน้อยกว่า 154 เซนติเมตร น้ำหนักที่เพิ่มขึ้นขณะตั้งครรภ์ตั้งแต่ 16 กิโลกรัม ขึ้นไป ดัชนีมวลกายก่อนการตั้งครรภ์ที่มากกว่า 25 กก/ม.^{2} ดัชนีมวลกายก่อนคลอดมากกว่า 25 กก/ม^2 และความสูงระหว่างกระดูกหัวหน่าวถึงยอดมดลูกตั้งแต่ 33 เซนติเมตร ขึ้นไป ปัจจัยเสี่ยงทั้งสามสามารถใช้ร่วมกันในการดูแลทางคลินิก และช่วยตัดสินวิธีการดูแลขณะคลอดในหญิงตั้งครรภ์ที่ไม่เคยคลอดบุตรมาก่อน