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Factors Associated with Shoulder Dystocia

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ABSTRACT

Objective: To evaluate the factors associated with occurrence of shoulder dystocia.

Materials and Methods: A case-control study, 67 pregnant women with shoulder dystocia between January 1st, 2009 and December 31st, 2013 and match 201 cases in control group by gestational age were analyzed. The factors that were thought to associate with shoulder dystocia were collected. Multivariate logistic regression analysis was performed to predict the factors.

Results: There were 15,200 singleton delivered vaginally during that period. The incidence rate of shoulder dystocia was 0.44%. Intrapartum risk factors of shoulder dystocia were assisted vaginal delivery; the adjusted odds ratio (AOR) was 7.16 (95% CI = 3.48 – 14.72) and delivered by obstetric residents; AOR = 3.80 (95% CI = 1.02-14.09). Only neonatal birth weight was neonatal factor that associated with shoulder dystocia and the risk increased with birth weight in direct variation. Maternal factors such as age, obesity, diabetes mellitus were not associated with risk. 27 neonates had neonatal morbidity (brachial plexus injury, clavicular fracture, neonatal death) those were observed only in shoulder dystocia group.

Conclusions: Neonatal birth weight, assisted vaginal delivery and delivered by obstetric residents were significantly associated with shoulder dystocia.

Keywords: shoulder dystocia, birth weight, assisted vaginal delivery

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Introduction

Shoulder dystocia (ShD) is defined as a failure to spontaneously deliver the fetal shoulders after delivery of the head[1]. Shoulder dystocia is a rare obstetric emergency condition that may cause serious complications and severe morbidities for both the mother and the child.

The incidence of shoulder dystocia varies between 0.6 and 1.4 percents[2]. In recent decades, the incidence of shoulder dystocia has increased may be due to increasing neonatal birth weight.

The most consistent and significant historical risk factors of shoulder dystocia have been fetal macrosomia and operative vaginal delivery. Other factors such as previous shoulder dystocia, maternal obesity, maternal diabetes mellitus, increased parity and induction of labor have also been reported[3, 4].

Infant morbidity is high and the condition may be fatal. Severity of neonatal morbidity is varies such as clavicular fracture or neurapraxia have a good prognosis. But in severe injury, the neonate may have permanent brachial plexus injury or neonatal death. Despite known risk factors, the occurrence of shoulder dystocia is regarded as unpredictable.

The majority of studies about shoulder dystocia have originated from populations in Europe and North America[4]. The evidences generated from western populations may not be appropriate for Asian women, who tend to be shorter and smaller. Information about shoulder dystocia risks in Asian people is limited. The aim of this study was to evaluate the factors associated with occurrence of shoulder dystocia in Thai population.

Material and Methods

The study was a case-control study. We collected the data from medical records of singleton pregnant women and their child who delivered at Khon Kaen Hospital, Thailand between January 1st, 2009 and December 31st, 2013. The study protocol was approved by the Khon Kaen Hospital Institute Review Board in Human Research.

The diagnosis of shoulder dystocia was made based on the entry in the obstetric record. Shoulder dystocia was diagnosed and coded when failed delivery of the anterior shoulder after downward fetal neck traction. Maternal demographic and intrapartum factors that might influence risk of shoulder dystocia were collected. These factors included maternal age, parity, height, weight, and body mass index (BMI), maternal diabetes mellitus (gestational and pre-existing), the evidence of induction or augmentation of labor and the assisted vaginal delivery. Neonatal factors and outcomes included birth weight, sex, APGAR score, neonatal morbidity/mortality were collected.

All pregnant women who had vaginal delivery with shoulder dystocia were included. Breech assisted delivery and intrauterine fetal death were excluded. For the selection of control subjects, a matched case-control analysis was performed by matching gestational age at delivery at a ratio of 1:3.

Sample size estimation for case-control study was calculated with base on the incidence of shoulder dystocia about 1.4 percents[2], odds ratio 15.4 when compare neonatal birth weight between 3,000 - 3,499 gm. and 4,000 – 4,499 gm. from previous study[3], power 0.8 and significant level at 0.95. The number of participants was at least 46 cases per group.

Statistical analysis

Categorical variables were tested using the Chi-square test and continuous variables were tested using Student T-test. All significant factors were further evaluated with multiple logistic regression to eliminate the effect of confounding factors. STATA 11 statistical software was used for analysis. P-value below 0.05 was considered statistically significant.

Results

26,028 pregnant women delivered at Khon Kaen Hospital between January 1st, 2009 and December 31st, 2013. 15,200 cases were singleton pregnancy with vaginal delivery. Of these, 67 pregnant women who delivered with event of shoulder dystocia were included in this study. The incidence rate of shoulder dystocia was 0.44%. The comparison of various characteristics of all maternal and neonate between ShD and non ShD are shown (Table 1). It was found that maternal age, prepregnancy BMI > 25 kg/m^2, medical/surgical complications, abnormal progression of labor, prolong second stage of labor, assisted vaginal delivery, delivery by obstetric resident, male infant and neonatal birth weight > 3,500 grams were significantly higher in ShD group. Maternal height was significantly shorter in ShD group. (all p-values were < 0.05). History of shoulder dystocia was no reported in both groups.

Table 1. Characteristics of maternal and neonate between ShD and non ShD, univariate analysis.

Factors	ShD group N = 67	Non ShD group N = 201	Crude OR	95% CI	P
Age, yrs, mean (SD)	27.1 (6.3)	24.2 (5.5)	1.09	1.04-1.14	< 0.001
Multiparity, n (%)	28.0 (41.2)	73 (36.3)	1.26	0.72-2.21	0.42
Maternal height, cm., mean (SD)	156.9 (5.2)	159.3 (6.0)	0.0007	0.00001-0.096	0.004
Maternal prepregnancy BMI, kg/m^2, mean (SD)					
< 18.5 kg/m^2, n (%)	23.9 (4.8)	20.9 (3.5)	1.19	1.10-1.30	< 0.001
18.5 – 22.9 kg/m^2, n (%)	6/60 (10.0)	50/186 (26.9)	1		
23 - 24.9 kg/m^2, n (%)	27/60 (45.0)	99/186 (53.2)	2.27	0.88-5.86	0.09
25 – 29.9 kg/m^2, n (%)	4/60 (6.7)	15/186 (8.1)	2.22	0.55-8.93	0.26
≥ 30 kg/m^2, n (%)	16/60 (26.7)	18/186 (9.7)	7.41	2.51-21.85	< 0.001
Over weight gain, n (%)	7/60 (11.7)	4/186 (2.2)	14.58	3.28-64.84	< 0.001
Maternal diabetes mellitus, n (%)	28/60 (46.7)	62/186 (33.3)	1.75	0.97-3.16	0.06
Medical/Surgical complications, n (%)	5 (7.5)	7 (3.5)	2.24	0.68-7.29	0.18
Short stature, n (%)	10 (14.9)	10 (5.0)	3.35	1.32-8.45	0.01
Induction of labor, n (%)	1 (1.5)	2 (1.0)	1.51	0.13-16.89	0.74
Abnormal progression of labor, n (%)	8 (11.9)	26 (12.9)	0.91	0.39-2.13	0.83
Augmentation of labor, n (%)	15 (22.4)	25 (12.4)	2.13	1.04-4.35	0.04
Prolong second stage of labor, n (%)	34 (30.7)	79 (39.3)	1.59	0.91-2.78	0.10
Assisted vaginal delivery, n (%)	5 (7.4)	2 (1.0)	8.02	1.51-42.39	0.014
Birth attendants, n (%)	30 (44.8)	17 (8.5)	8.78	4.39-17.53	< 0.001
Staffs	4 (6.0)	21 (10.4)	1		
Residents	50 (74.6)	74 (37.4)	4.68	1.50-14.57	0.008
Interns	1 (1.5)	6 (3.0)	0.88	0.08-9.38	0.91
Nurses	12 (18.0)	100 (49.8)	0.68	0.17-2.69	0.59
Fetal gender, n (%) vvvv					
Male	44 (65.7)	92 (45.8)	1		
Female	23 (34.3)	109 (54.2)	0.44	0.25-0.78	0.005
Neonatal birth weight, n (%)					
< 3,000 grams	2 (3.0)	88 (43.8)	1		
3,000 – 3,499 grams	16 (23.9)	89 (44.3)	7.91	1.76-35.42	0.007
3,500 – 3,999 grams	29 (43.3)	22 (10.9)	58.00	12.85-261.80	< 0.001
≥ 4,000 grams	20 (29.8)	2 (1.0)	374.0	49.24-2,840.78	< 0.001

OR = Odds ratio, CI = Confidence interval, BMI = body mass index

By multivariate logistic regression analysis, only neonatal birth weight, assisted vaginal delivery and delivered by obstetrics residents when compared with staffs were significant factors associated with shoulder dystocia (Table 2).

Six pregnant women in ShD group had postpartum hemorrhage and found 5 cases in another group. No maternal death was reported. 27 cases of neonatal injury were occurred in ShD group (6 clavicular fracture, 16 brachial plexus injury, 5 neonatal death). Severe birth asphyxia was the cause of death in 4 neonates and the other was congenital heart anomaly (complete atrioventricular canal).

Table 2. Multivariate logistic regression analysis of risk factors of shoulder dystocia.

Risk factors	Adjusted Odds ratio*	95%confidence interval	P
Maternal prepregnancy BMI			
< 18.5 kg/m^2	1		
18.5 - 22.9 kg/m^2	1.59	0.45 – 5.63	0.47
23 - 24.9 kg/m^2	1.86	0.27 – 12.74	0.53
25 - 29.9 kg/m^2	2.41	0.55 – 10.58	0.24
≥ 30 kg/m^2	6.99	0.85 – 57.53	0.07
Birth attendants			
Staffs	1		
Residents	3.80	1.02 – 14.09	0.04
Interns	2.33	0.19 – 29.23	0.52
Nurses	0.61	0.12 – 3.10	0.55
Assisted vaginal delivery	7.16	3.48 – 14.72	> 0.001
Prolong second stage of labor	4.19	0.74 – 23.83	0.10
Neonatal birth weight**			
< 3,000 grams	1		
3,000 – 3,499 grams	12.24	2.51 – 57.67	0.002
3,500 – 3,999 grams	113.58	20.64 – 625.02	< 0.001
≥ 4,000 grams	932.70	85.46 – 10,178.97	< 0.001
Fetal gender			
Male	1		
Female	0.76	0.36 – 1.62	0.48

BMI = body mass index

*Adjusted for maternal age, maternal height, Birth attendants, maternal medical/surgical complications, neonatal birth weight.

** Adjusted for maternal age, maternal height, Birth attendant, maternal medical/surgical complications.

Discussion

The incidence of shoulder dystocia was 0.44%. The significant risk factors in this study were assisted vaginal delivery, birth attendants by obstetric residents and neonatal birth weight. Maternal age, prepregnancy BMI, maternal height, maternal obesity, maternal diabetes mellitus, abnormal progression of labor, prolong second stage of labor and fetal gender were not associated with shoulder dystocia.

The incidence of shoulder dystocia was 0.44%. However, from literature reviews, the incidence of shoulder dystocia varies between 0.6 and 1.4 percent[2]. Lower incidence of shoulder dystocia in our study might be resulted from Thai babies' birth weight were lower than either American or Europe babies'.

High risk pregnant women had higher assisted vaginal delivery than spontaneous delivery, adjusted odds ratio was 7.16 (95% CI= 3.48-14.72), similar to previous studies (OR 3.98-12.11)[4, 5].

The risk of shoulder dystocia was increased when neonatal birth weight increased same as many studies. Moreover we cannot know the exactly birth weight before delivery. Therefore the accuracy of estimated fetal weight is very important to predict the occurrence of shoulder dystocia. However 3rd trimester ultrasound for macrosomia detection has poor sensitivity and positive predictive value[6], so shoulder dystocia is currently unpredictable.

This study found that the birth attendant associated with shoulder dystocia when delivered by obstetric residents compared with obstetric staffs. The major causative was the residents have lower experience to estimate fetal weight and less skill than staffs. However, this is the valuable result to reflect our institute for improvement of skill training to obstetrics residents.

Maternal obesity was not independent risk factor despite it was significant risk factor in univariate analysis, same as H. Robinson et al[7].

Studies had shown maternal diabetes mellitus associated with shoulder dystocia[4, 8] but in our study found it was not significant factor, same as J. Parantainen[5]. It might be resulted from improvement of diagnosis and management in diabetic pregnant women. This study did not have women with history of shoulder dystocia, might be due to almost mothers with history of shoulder dystocia got cesarean delivery with bad obstetrics as an indication. Induction and augmentation of labor also did not associated with shoulder dystocia, differ from study of Mazouni et al. that found induction of labor were significant risk factor for shoulder dystocia[9].

Maternal complications was not different between both groups but high incidence of neonatal morbidity was found in shoulder dystocia group same as previous studies[5].

The limitations of this study were a retrospective design that could not completely record all variables. The number of cases in control group should more than 1:3 might be improved the effect of results.

Conclusions

Neonatal birth weight, assisted vaginal delivery and delivered by obstetrics resident were associated with shoulder dystocia. This information may be useful for counseling and also for early identification of pregnant women who have a high-risk of shoulder dystocia.

References

1. Cunningham FG, Leveno KJ, Bloom SL, Spong CY, Dashe JS, Hoffman BL, et al. Williams Obstetrics. 24 ed: McGraw-Hill Education; 2014.
2. ACOG practice bulletin clinical management guidelines for obstetrician-gynecologists. Obstet Gynecol 2002;100:1045-50.
3. Overland EA, Vatten LJ, Eskild A. Pregnancy week at delivery and the risk of shoulder dystocia: a population study of 2,014,956 deliveries. BJOG 2013;121:34–42.
4. Cheng YKY, Lao TT, Sahota DS, Leung VK-T, Leung TY. Use of birth weight threshold for macrosomia to identify fetuses at risk of shoulder dystocia among Chinese populations. Intl J Gynecol Obstet 2013;120:249-53.
5. Parantainen J, Palomäki O, Talola N, Uotila J. Clinical and sonographic risk factors and complications of shoulder dystocia – a case-control study with parity and gestational age matched controls. Eur J Obstet Gynecol Reprod Biol 2014;177:110-4.
6. Mehta SH, Sokol RJ. Shoulder dystocia: Semin Perinatol 2014;38:189-93.
7. Robinson H, Tkatsch S, Mayes DC, Bott N, Okun N. Is

maternal obesity a predictor of shoulder dystocia? Obstet Gynecol 2003;101:24-7.
8. Tsur A, Sergienko R, Wiznitzer A, Zlotnik A, Sheiner E. Critical analysis of risk factors for shoulder dystocia. Arch Gynecol Obstet 2012;285:1225–9.
9. Mazouni C, Porcu GR, Cohen SE, Heckenroth H, Guidicelli B, Bonnier P, et al. Maternal and anthropomorphic risk factors for shoulder dystocia. Acta Obstet Gynecol Scand 2006;85:567-70.

ปัจจัยที่สัมพันธ์กับภาวะคลอดติดไหล่

เจษฎา วุฒิธรรมสุข, อุษณีย์ สังคมกำแหง, ธนนิตย์ สังคมกำแหง

วัตถุประสงค์: *เพื่อศึกษาปัจจัยที่สัมพันธ์กับการเกิดภาวะคลอดติดไหล่*

วัสดุและวิธีการ: *เป็นการศึกษาแบบ case-control โดยคำนวณกลุ่มตัวอย่างได้ 46 คน จากการรวบรวมข้อมูลพบสตรีตั้งครรภ์มีภาวะคลอดติดไหล่ 67 รายระหว่างวันที่ 1 มกราคม พ.ศ.2552 ถึง 31 ธันวาคม พ.ศ. 2556 กลุ่มควบคุมคัดเลือกจากสตรีตั้งครรภ์ที่มีอายุครรภ์เมื่อคลอดใกล้เคียงกัน จากนั้นรวบรวมข้อมูลปัจจัยที่คาดว่าสัมพันธ์กับภาวะคลอดติดไหล่ และใช้การวิเคราะห์ปัจจัยเสี่ยงแบบ Multivariate logistic regression*

ผลการศึกษา: *สตรีตั้งครรภ์เดี่ยวที่คลอดทางช่องคลอดมีจำนวน 15,200 ราย คิดเป็นอุบัติการณ์ภาวะคลอดติดไหล่ร้อยละ 0.44 ปัจจัยเสี่ยงในช่วงระยะคลอดได้แก่ การใช้หัตถการช่วยคลอด มีค่า adjusted odds ratio (AOR) เท่ากับ 7.16 (95 % CI = 3.48 – 14.72) และการคลอดโดยแพทย์ประจำบ้าน AOR เท่ากับ 3.80 (95 % CI = 1.02-14.09) ปัจจัยของทารกมีเพียงน้ำหนักตัวแรกเกิดที่สัมพันธ์กับภาวะคลอดติดไหล่ และความเสี่ยงจะเพิ่มขึ้นแปรผันตรงกับน้ำหนักแรกเกิดของทารก ปัจจัยของมารดา เช่น อายุ ภาวะอ้วน เบาหวาน ไม่สัมพันธ์กับภาวะคลอดติดไหล่ พบทารกมีภาวะทุพพลภาพแต่กำเนิด (กระดูกไหปลาร้าหัก บาดเจ็บเส้นประสาท brachial plexus ทารกเสียชีวิต) ทั้งสิ้น 27 ราย โดยพบเฉพาะในกลุ่มที่มีภาวะคลอดติดไหล่*

สรุป: *น้ำหนักตัวแรกเกิด การใช้หัตถการช่วยคลอด และการคลอดโดยแพทย์ประจำบ้าน เป็นปัจจัยที่สัมพันธ์กับภาวะคลอดติดไหล่อย่างมีนัยสำคัญทางสถิติ*
