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Cesarean Section Rate and Associated Risk Factors in Group 1 Robson Classification

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ABSTRACT

Objectives: To evaluate cesarean section (CS) rate among women in group 1 Robson classification, pregnancy outcomes and associated factors.

Materials and Methods: A total of 800 women classified in group 1 Robson classification were included. Data were extracted from medical records including maternal demographic data, obstetric characteristics, labor characteristics and management (cervical dilatation on admission, types of membranes rupture, cervical dilatation at artificial membranes rupture, labor augmentation, and use of analgesia), route of delivery, indications for CS, and pregnancy outcomes.

Results: Overall CS rate was 24.7%. Majority had cervical dilation at admission of < 5 cm (86%). Amniotomy was performed in 66.4% and, of which, 36.3% were performed when cervical dilatation of < 5 cm. Cephalopelvic disproportion (CPD) was the most common indication (74.7 %) followed by and non-reassuring fetal heart rate status (21.2%). Univariate analysis showed that maternal overweight and obesity, cervical dilatation of < 5 cm at admission, spontaneous rupture of the membranes, amniotomy at cervical dilatation of < 5 cm, gestational diabetes mellitus, and preeclampsia were significantly associated with CS. Logistic regression analysis revealed that significant independent factors for CS included overweight or obesity (adjusted odds ratio (OR) 1.58, 95% confidence interval (CI) 1.04-2.10, p = 0.033), amniotomy at cervical dilatation of < 5 cm and spontaneous rupture of membranes (adjusted OR 2.62, 95%CI 1.65-4.17, p < 0.001 and adjusted OR 2.87, 95%CI 1.82-4.53, p < 0.001 respectively).

Conclusion: CS rate among women in group 1 Robson classification was 24.7%. Maternal overweight and obesity, spontaneous rupture of membranes, amniotomy at cervical dilatation of < 5 cm, and preeclampsia were independent associated factors for CS.

Keywords: cesarean section, Robson classification, group 1, risk factors

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อัตราการผ่าตัดคลอดและปัจจัยเสี่ยงในสตรีตั้งครรภ์กลุ่ม 1 ตามการแบ่งแบบร็อบสัน (Robson Classification)

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บทคัดย่อ

วัตถุประสงค์: *เพื่อศึกษาอัตราการผ่าตัดคลอด ผลลัพธ์ของการตั้งครรภ์ และปัจจัยเสี่ยงที่เกี่ยวข้องในสตรีตั้งครรภ์ที่จัดอยู่ในกลุ่ม 1 ตามการแบ่งแบบร็อบสัน (Robson classification)*

วัสดุและวิธีการ: *ทำการศึกษาในสตรีตั้งครรภ์ในกลุ่ม 1 ตามการแบ่งแบบร็อบสันทั้งหมด 800 ราย ทำการสืบค้นข้อมูลจากเวชระเบียน ประกอบด้วย ข้อมูลพื้นฐาน ข้อมูลทางสูติศาสตร์ ข้อมูลการคลอดและการดูแลรักษา (การเปิดของปากมดลูกขณะแรกรับ รูปแบบการแตกของถุงน้ำคร่ำ การเปิดของปากมดลูกขณะเจาะถุงน้ำคร่ำ การใช้ยากระตุ้นการหดรัดตัวของมดลูก และการให้ยาระงับปวด) ช่องทางการคลอด ข้อบ่งชี้การผ่าตัดคลอด และผลลัพธ์ของการตั้งครรภ์*

ผลการศึกษา: *อัตราการผ่าตัดคลอดเท่ากับร้อยละ 24.7 สตรีตั้งครรภ์ส่วนใหญ่มีการเปิดของปากมดลูก < 5 ซม. ขณะแรกรับ มีการเจาะถุงน้ำคร่ำร้อยละ 66.4 และร้อยละ 36.3 มีการเจาะถุงน้ำคร่ำขณะที่ปากมดลูกเปิด < 5 ซม. ภาวะช่องเชิงกรานไม่ได้สัดส่วนกับขนาดของศีรษะทารกพบเป็นข้อบ่งชี้หลักของการผ่าตัดคลอด (ร้อยละ 74.7) รองลงมาคือภาวะหัวใจทารกเต้นผิดปกติ (ร้อยละ 21.2) การวิเคราะห์แบบ univariate พบว่า มารดาน้ำหนักเกินและอ้วน การเปิดของปากมดลูก < 5 ซม. ขณะแรกรับ การแตกเองของถุงน้ำคร่ำ การเจาะถุงน้ำคร่ำขณะที่ปากมดลูกเปิด < 5 ซม. ภาวะเบาหวานขณะตั้งครรภ์ และภาวะครรภ์เป็นพิษ เป็นปัจจัยที่สัมพันธ์กับการผ่าตัดคลอดอย่างมีนัยสำคัญทางสถิติ การวิเคราะห์ถดถอยโลจิสติค พบว่าปัจจัยอิสระที่มีผลอย่างมีนัยสำคัญต่อการผ่าตัดคลอดคือ มารดาน้ำหนักเกินและอ้วน (adjusted odds ratio (OR) 1.58, 95% confidence interval (CI) 1.04-2.10, p = 0.033) การเจาะถุงน้ำคร่ำขณะที่ปากมดลูกเปิด < 5 ซม. และการแตกเองของถุงน้ำคร่ำ (adjusted OR 2.62, 95%CI 1.65-4.17, p < 0.001 และ adjusted OR 2.87, 95%CI 1.82-4.53, p < 0.001 ตามลำดับ)*

สรุป: *อัตราการผ่าตัดคลอดของสตรีตั้งครรภ์ในกลุ่ม 1 ตามการแบ่งแบบร็อบสันเท่ากับร้อยละ 24.7 มารดาน้ำหนักเกินและภาวะอ้วน การแตกเองของถุงน้ำคร่ำ การเจาะถุงน้ำคร่ำขณะที่ปากมดลูกเปิด < 5 ซม. และภาวะครรภ์เป็นพิษ เป็นปัจจัยอิสระที่สัมพันธ์กับการผ่าตัดคลอดบุตร*

คำสำคัญ: *การผ่าตัดคลอดบุตร, การแบ่งแบบร็อบสัน, กลุ่ม1, ปัจจัยเสี่ยง*

Introduction

Cesarean section (CS) is a life-saving intervention for women and newborns when complications occur, such as antepartum hemorrhage, fetal distress, abnormal fetal presentation, and hypertensive disease[1]. However, risk of various short- and long-term complications of current and future pregnancies are associated with the procedures, including uterine rupture, abnormal placentation, ectopic pregnancy, stillbirth, and preterm birth, and these risks increase in a dose–response manner[2-4]. According to the World Health Organization (WHO), appropriate CS rate should be between 10-15% and unnecessary procedures should be avoided because of potential risks of adverse outcomes without additional benefits to the mothers and their fetuses[1, 5].

Currently, there is a worldwide increase in CS rate in both developed and developing countries[6-8]. It is estimate that 29.7 million (21.1%) births occurred through CS in 2015, which was almost double the number of births by this method in 2000[6, 7]. Many previous reports showed that CS rate significantly increased in all the countries, including Thailand[2, 4, 8].

In classification of CS, the use of Robson classification system, which classify pregnant women into ten systematic groups (Table 1), is currently recommended by WHO and other international organizations[1, 5]. Previous systematic reviews identified this classification as the most appropriate system to fulfil current international and local needs[9, 10]. The use of a single CS classification will facilitate auditing, analyzing and comparing CS rates across different settings and help to create and implement effective strategies to optimize CS rates.

Increase in CS rate was also observed in Siriraj Hospital, which is a large university-based tertiary care hospital with over 6,000 deliveries each year. In 2017, Siriraj Hospital has adopted Robson classification system to identify pregnant women and evaluate CS rate. A recent report of data in 2017 showed that overall CS rate was 48.9%. The highest contribution of CS was in group 1 of Robson classification with CS rate of 37.1% and contributed to 23.2% of all CS[11]. Some interventions were then developed and implemented as an effort to reduce the high CS rate, especially among this specific group of women. Strategies to prevent primary CS was adopted from many recommendations[12-14]. This include changes in intrapartum care, such as active phase should be considered at cervical dilatation of 4-5 cm, abnormal cervical progression should not be limited to 1 cm/hour, early amniotomy should be avoided, etc.

Data on CS rate among women in group 1 of Robson classification is important that this group has the highest contribution to overall CS. In addition, women in group 1 Robson classification are considered low risk that the CS rate should not be too high compared to what is recommended. Understanding the rate and associated factors for CS, especially in this group of highest CS contribution, could help in planning appropriate strategies and interventions for reducing both group-specific and overall CS rate. Therefore, the primary objective of this study was to evaluate CS rate among women classified into group 1 of Robson classification. In addition, pregnancy outcomes and factors associated with CS were evaluated.

Materials and Methods

After study protocol was approved by Siriraj institutional review board, a cross-sectional study was conducted, including 800 pregnant women who were classified into group 1 of Robson classification, i.e., nulliparous with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labor (Table 1) during September 2019 to March 2020. Cases with private care were excluded. A sample size was estimated from CS rate among women in group 1 Robson classification of 35%. At 95% significance level and 3.5% acceptable error, at least 786 women were needed, including 10% loss or incomplete data.

Table 1. Robson classification.

Group	Characteristics
Group 1	Nulliparous with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labor
Group 2	Nulliparous with single cephalic pregnancy, ≥ 37 weeks gestation who either had labor induced (2a) or were delivered by caesarean section before labor (2b)
Group 3	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation in spontaneous labor
Group 4	Multiparous without a previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation who either had labor induced (4a) or were delivered by caesarean section before labor (4b)
Group 5	All multiparous with at least one previous uterine scar, with single cephalic pregnancy, ≥ 37 weeks gestation
Group 6	All nulliparous women with a single breech pregnancy
Group 7	All multiparous women with a single breech pregnancy, including women with previous uterine scars
Group 8	All women with multiple pregnancies, including women with previous uterine scars
Group 9	All women with a single pregnancy with a transverse or oblique lie, including women with previous uterine scars
Group 10	All women with a single cephalic pregnancy < 37 weeks gestation, including women with previous scars

Siriraj Hospital is the largest university-based tertiary care hospital with approximately 6,000 deliveries per year. Data on Robson classification were collected prospectively in a systematic manner since 2017. All necessary obstetric variables for Robson classification, including parity, number of fetuses, gestational age, previous CS, fetal lie and presentation, and route of delivery, were recorded using a specific form after delivery of each woman. Recorded data were later entered into a computer using a spreadsheet software and the data were checked and cleaned. Data analyses were performed and Robson classification was reported monthly.

In late 2019, changes in intrapartum care have been implemented according to various recommendations[12-14]. This included that active phase is considered at cervical dilatation of 4-5 cm, abnormal cervical progression should not be limited to 1 cm/hour, and early amniotomy should be avoided. This was in response to the high rate of CS observed during previous years and the audit of medical records on intrapartum care practice. The changes were clarified and distributed to all the residents and staff for cooperation. Although early amniotomy is advised to be avoided, individual judgment on amniotomy was under consideration of on duty residents under staff supervision, which was customized for each woman. Analgesics were also provided for women in active phase as necessary under consideration of caring physicians. Cephalopelvic disproportion (CPD) was diagnosed when labor fails to progress despite 4 hour of adequate uterine activity or at least 6 hours of oxytocin administration with inadequate uterine activity and no cervical change. Second opinion from on duty staff was mandatory for all decisions for CS.

Data were extracted from medical records including maternal demographic data, obstetric characteristics, labor characteristics and management, route of delivery, indications for CS, and pregnancy outcomes. Labor management included cervical dilatation on admission, types of membranes rupture, cervical dilatation at artificial membranes rupture, labor augmentation, and use of analgesia were also reviewed.

Continuous variables were reported as mean and standard deviation (SD), while categorical variables were reported as percentage. Pregnancy outcomes were compared between those with CS and vaginal deliveries using student t test and chi square test as appropriate. Risk of CS according to various characteristics were evaluated. Relative risks (RR) and 95% confidence intervals (CI) were estimated. Independent risk associated with CS were determined by logistic regression analysis. Adjusted odds ratio (OR) and 95%CI were estimated. A p value of < 0.05 was considered statistically significant.

Results

A total of 800 pregnant women in group 1 Robson

classification were reviewed and included. Baseline characteristics of the women are shown in Table 2. Mean maternal age was 27 years and mean gestational age was 38.6 weeks. Mean body mass index (BMI) was 21.8 kg/m^2 and 17.7% were overweight or obese. Gestational diabetes mellitus (GDM), chronic hypertension, and preeclampsia was found in 11.9%, 4.1%, and 3.8%, respectively.

Table 2. Baseline characteristics of pregnant women (n = 800).

Characteristics	n (%)
Mean age ± SD (years)	27.0 ± 6.2
Mean GA ± SD (weeks)	38.6 ± 1.0
Mean BMI ± SD (kg/m^2)	21.8 ± 4.4
BMI category	
Normal	490 (61.3)
Underweight	168 (21)
Overweight/obese	142 (17.7)
Complications	
GDM	95 (11.9)
Chronic hypertension	33 (4.1)
Preeclampsia	30 (3.8)

SD: standard deviation, GA: gestational age, BMI: body mass index, GDM: gestational diabetes mellitus

Labor and delivery characteristics of pregnant women are shown in Table 3. Majority had cervical dilation at admission of < 5 cm (86%). Amniotomy was performed in 66.4% and 36.3% were performed when cervical dilatation of < 5 cm. Labor was augmented in 64% and 48% received analgesia during labor. Overall CS rate in this study was 24.7 %. CPD was the most common indication (74.7 %) followed by and non-reassuring fetal heart rate (FHR) status (21.2%). Mean birth weight was 3,051.3 g and majority were appropriate for gestational age (AGA) (82.9%).

Table 3. Labor and delivery characteristics of pregnant women (n = 800).

Characteristics	n (%)
Cervical dilation at admission	
< 5 cm	688 (86)
≥ 5 cm	112 (14)
Rupture of membranes	
Spontaneous	269 (33.6)
Amniotomy at < 5 cm	290 (36.3)
Amniotomy at ≥ 5 cm	241 (30.1)
Augmentation of labor	512 (64)
Received analgesia	384 (48)
Route of delivery	
Vaginal delivery	602 (75.3)
Cesarean section	198 (24.7)
Indications of CS (n = 198)	
CPD	148 (74.7)
Non-reassuring FHR	42 (21.2)
Others	8 (4.1)

Table 3. Labor and delivery characteristics of pregnant women (n = 800). (Cont.)

Characteristics	n (%)
Birth weight for gestational age	
AGA	663 (82.9)
SGA	98 (12.3)
LGA	39 (4.8)
Macrosomia	7 (0.9)
Low birth weight	50 (6.3)
Apgar score 1 min < 7	24 (3)
Apgar score 5 min < 7	3 (0.4)
NICU admission	3 (0.4)

CS: cesarean section, CPD: cephalopelvic disproportion, FHR: fetal heart rate, SD: standard deviation, AGA: appropriate for gestational age, SGA: small for gestational age, LGA: large for gestational age, NICU: neonatal intensive care unit

Comparisons of characteristics between those with vaginal delivery and CS were performed to evaluate possible associated factors for CS and the results are displayed in Table 4. Those with CS had significantly higher maternal age and BMI (p < 0.001). Risk of CS significantly increased among overweight or obese women (RR 1.5, 95%CI 1.1-1.9, p = 0.009). Cervical dilatation of < 5 cm at admission significantly increased the risk of CS (RR 2.1, 95%CI 1.3-3.5, p = 0.001). Spontaneous rupture of the membranes and amniotomy at cervical dilatation of < 5 cm also significantly increased the risk of CS (RR 2.2, 95%CI 1.5-3.2, p = 0.001 and RR 2.3, 95%CI 1.6-3.3, p < 0.001, respectively). GDM and preeclampsia also significantly increased the risk of CS (RR 1.5, 95%CI 1.1-2.0, p = 0.016 and RR 2.7, 95%CI 2.0-3.7, p < 0.001, respectively).

Table 4. Risk of CS according to various characteristics.

Characteristics	Vaginal delivery (n = 602)	CS (n = 198)	RR (95%CI)	p value
Mean age ± SD (years)	26.3 ± 5.9	28.9 ± 5.9		< 0.001
Mean BMI ± SD (kg/m^2)	21.4 ± 4.1	22.8 ± 4.9		< 0.001
BMI category				0.007
Normal	374 (76.3%)	116 (23.7%)	1.0	
Underweight	135 (80.4%)	33 (19.6%)	0.8 (0.6-1.2)	0.283
Overweight/obese	93 (67%)	49 (33%)	1.5 (1.1-1.9)	0.009
Cervical dilation at admission				0.001
≥ 5 cm	98 (87.5%)	14 (12.5%)	1.0	
< 5 cm	504 (73.3%)	184 (26.7%)	2.1 (1.3-3.5)	
Rupture of membranes				0.048
Amniotomy at ≥ 5 cm	209 (86.7%)	32 (13.3%)	1.0	
Amniotomy at < 5 cm	202 (69.7%)	88 (30.3%)	2.3 (1.6-3.3)	< 0.001
Spontaneous	191 (71%)	78 (29%)	2.2 (1.5-3.2)	< 0.001
GDM				0.016
No	540 (76.6%)	165 (23.4%)	1.0	
Yes	62 (65.3%)	33 (34.7%)	1.5 (1.1-2.0)	

Table 4. Risk of CS according to various characteristics. (Cont.)

Characteristics	Vaginal delivery (n = 602)	CS (n = 198)	RR (95%CI)	p value
Preeclampsia				<0.001
No	591 (76.8%)	179 (23.2%)	1.0	
Yes	11 (36.7%)	19 (63.3%)	2.7 (2.0-3.7)	
Chronic hypertension				0.631
No	576 (75.1%)	191 (24.9%)	1.0	
Yes	26 (78.8%)	7 (21.2%)	0.9 (0.4-1.7)	
Augmentation of labor				0.054
No	228 (79.2%)	60 (20.8%)	1.0	
Yes	374 (73%)	138 (27%)	1.3 (1.0-1.7)	
Received analgesia				0.738
No	311 (74.8%)	105 (25.2%)	1.0	
Yes	291 (75.8%)	93 (24.2%)	0.9 (0.7-1.2)	

CS: cesarean section, RR: risk ratio, CI: confidence interval, SD: standard deviation, BMI: body mass index, GDM: gestational diabetes mellitus

Comparison of pregnancy outcomes between women with vaginal delivery and cesarean section are shown in Table 5. Women with CS had significantly higher mean birth weight and more likely to have large-for-gestational-age (LGA) and macrosomia ($p < 0.001$). In addition, they were more likely to have infants with 5-minute Apgar score of < 7 ($p = 0.015$). Immediate postpartum hemorrhage was comparable between the 2 groups. No other serious adverse events were observed in both groups.

Table 5. Comparison of pregnancy outcomes between women with vaginal delivery and cesarean section.

Characteristics	Vaginal delivery (n = 602)	CS (n = 198)	p value
Mean birth weight ± SD (g)	2,999.8 ± 351.2	3,207.8 ± 436.1	< 0.001
Birth weight for gestational age			< 0.001
AGA	496 (82.4%)	167 (84.3%)	
SGA	86 (14.3%)	12 (6.1%)	
LGA	20 (3.3%)	19 (9.6%)	
Macrosomia	1 (0.2%)	6 (3%)	< 0.001
LBW	42 (7%)	8 (4%)	0.139
Immediate postpartum hemorrhage	45 (7.5%)	12 (6.1%)	0.502
Apgar score 1 min < 7	16 (2.7%)	8 (4%)	0.323
Apgar score 5 min < 7	0 (0%)	3 (1.5%)	0.015
NICU admission	1 (0.2%)	2 (1%)	0.153

CS: cesarean section, SD: standard deviation, AGA: appropriate for gestational age, SGA: small for gestational age, LGA: large for gestational age, LBW: low birth weight, NICU: neonatal intensive care unit

Logistic regression analysis was performed in order to determine independent risk for CS (Table 6). After adjusting for potential confounders, significant independent factors for CS included overweight or obese (adjusted OR 1.58, 95%CI 1.04-2.10, $p = 0.033$), amniotomy at cervical dilatation < 5cm and spontaneous rupture of membranes (adjusted OR 2.62, 95%CI 1.65-4.17, $p < 0.001$ and adjusted OR 2.87, 95%CI 1.82-4.53, $p < 0.001$, respectively)

Table 6. Logistic regression analysis to determine independent risk of cesarean section.

Risk factors	Adjusted OR	95%CI	p value
BMI category			
Normal	1.0		
Underweight	0.80	0.51-1.25	0.325
Overweight/obese	1.58	1.04-2.10	0.033
Rupture of membranes			
Amniotomy at ≥ 5 cm	1.0		
Amniotomy at < 5 cm	2.62	1.65-4.17	< 0.001
Spontaneous	2.87	1.82-4.53	< 0.001
Preeclampsia	5.31	2.42-11.65	< 0.001

Adjusted for age, cervical dilatation at admission, augmentation of labor, GDM, chronic hypertension
OR: odds ratio, CI: confidence interval, BMI: body mass index, GDM: gestational diabetes mellitus

Discussion

The study included 800 women who were classified in group 1 of Robson classification during September 2019 to March 2020. Overall CS rate was 24.7%. The CS rate was lower than a previous study from the same institution of 37.1%[11]. The lower CS rate among this group of women might possibly due to the changes in intrapartum care that were adopted from many recommendations[12-14], which included that active phase should be considered at cervical dilatation of 4-5 cm, abnormal cervical progression should not be limited to 1 cm/hour, early amniotomy should be avoided, etc. However, the rate was still higher than what was recommended by WHO[1], possibly due to the nature of the hospital which is a tertiary care institute. In terms of CS indications, majority of CS indication in this study was CPD which was similar to a previous report[15].

In this study, amniotomy was performed in 66.4% and 36.3% was done when cervical dilation was < 5 cm. The results also showed that risk of CS significantly increased when amniotomy was performed at cervical dilatation of < 5 cm compared to ≥ 5 cm. As recommended by World Health Organization (WHO), American College of Obstetricians and Gynecologists (ACOG), and The Society for Maternal-Fetal Medicine (SMFM), the use of amniotomy alone, and early amniotomy with early oxytocin augmentation for prevention of delay in labor is not recommended[13, 14, 16, 17]. The recommendation was based on that there was not enough evidence that early amniotomy could reduce the duration of first stage of labor, reduce CS and improve other clinical outcomes[13]. It is also possible that early amniotomy before active phase was reached could also increase the risk of other complications such as infection, especially as first stage would continue for a longer period of time than after active phase. Increased in CS rate was also observed in those with spontaneous membranes rupture as well. This could possibly be due to variations in labor management and differences in decision of CS. More detailed information and analysis are needed to elucidate the definite explanations.

As expected, maternal overweight and obesity were another significant associated factor for CS that was observed in this study. Similar findings have been reported from previous studies[18, 19]. A recent analysis of women in group 1 Robson classification from WHO global survey on maternal and perinatal health, 2004-2008, also showed significant association between maternal overweight and obesity and increased CS rate. (18) It is also suggested that there should be worldwide strategies and interventions to reduce overweight and obesity among women intending to become pregnant as well as maintaining appropriate gestational weight gain during pregnancy to reduce CS rate in the future[20].

The results also showed that preeclampsia was strongly increased the risk of CS. This was also similar to previous reports[21]. Being obstetrically high-risk is among significant factors associated with CS among women in group 1 Robson classification, as reported

by WHO[18]. The increased risk might be from the severity of the disease that could adversely affect fetal growth and well-being as well as possible deterioration with delayed delivery. Safe reduction of the rate of primary cesarean deliveries will require different approaches for each of these, as well as other indications.

Different approaches are required in order to safely reduce the CS rate among this group of women that should be customized for each setting with different contexts as well as individualized for each woman. In addition to some recommended clinical interventions, non-clinical interventions to reduce unnecessary CS are also recommended by WHO[22]. This should also be adopted into general practice as well.

Not surprisingly, rates of LGA and macrosomia were more common among those with CS as both conditions themselves increased the risk of the procedure. Other pregnancy outcomes were not clinically different between the 2 groups and no serious adverse event was observed. However, conclusion on safety issues of CS cannot be confirmed. Data on long-term complications as well as risks of adverse events in future pregnancies are not available from this study and needed to be evaluated in the future.

The strengths of this study may include that data on Robson classification is well-established and has been routinely and systematically record. Information of all included women were reviewed that misclassifications should be minimal. However, some limitations should be addressed. Detailed individual information on labor progression and management were incomplete and not readily available. Although a guideline for intrapartum management exists, there were some variations in actual labor management according to different attending staff and residents as well as variations in individual cases of pregnant women. Such information, therefore, could not be taken into account in the analysis. Although CS rate were reduced from previous report, data on CS-related complications were not included and compared. As data were from a single university-based tertiary care hospital in Thailand, further generalization of the results might be limited due to possible different population characteristics and clinical contexts.

Nonetheless, the results of this study revealed the nature of CS among women in group 1 Robson classification in terms of CS rate and possible associated factors. However, rooms for improvement should be further identified, possibly via regular audit cycles. This will help planning for appropriate strategies to further reduce unnecessary CS in the future. The study also showed that adjustment of intrapartum care protocol as recommended by many authorities could somehow help reducing the CS rate among women in group 1 Robson classification. However, the practice should be further customized to each setting with different contexts and resources. The use of Robson classification is encouraged in every setting to identify the problem and better plan for group-specific strategies to reduce unnecessary CS, customized for each setting. Future studies are still warranted in order to understand more about the increasing CS in other settings in Thailand, both for group-specific and overall CS rate to minimize unnecessary operations for better maternal and child health.

Conclusion

CS rate among women in group 1 Robson classification was 24.7%. Majority of indication was CPD. Maternal overweight and obesity, spontaneous rupture of membranes, amniotomy at cervical dilatation of < 5 cm, and preeclampsia were independent associated factors for CS.

Potential conflicts of interest

The authors declare no conflicts of interest.

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