



## Original Article

## Emergency cesarean section rate between women with gestational diabetes and normal pregnant women



Dittakarn Boriboonhirunsarn\*, Rungnapa Waiyanikorn

Department of Obstetrics and Gynaecology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok, Thailand

## ARTICLE INFO

Article history:  
Accepted 13 August 2015

Keywords:  
emergency cesarean section  
gestational diabetes  
Parity

## ABSTRACT

**Objective:** Gestational diabetes mellitus (GDM) has been related to various maternal and neonatal complications. The degree to which GDM is related to an increased rate of cesarean section is less certain. This study was aimed at comparing the incidence of emergency cesarean delivery between pregnant women with GDM and normal pregnant women.

**Materials and methods:** The study group consisted of 237 term, singleton pregnant women with GDM. Another 237 uncomplicated, normal pregnant women were randomly selected and served as the comparison group. Those who were scheduled for elective cesarean delivery and overt DM were excluded. Data were retrieved from medical records, including demographic data, antenatal and intrapartum care data, route of delivery, indications for cesarean delivery, and neonatal outcomes.

**Results:** The study group had a significantly higher mean age and body mass index, and the participants were more likely to be overweight/obese. The rate of emergency cesarean delivery was significantly higher in the study group than in the comparison group (31.6% vs. 19.4%,  $p = 0.002$ ). The study group was more likely to have Cephalo-pelvic disproportion (CPD) (20.3% vs. 13.1%,  $p = 0.036$ ) as an indication for cesarean delivery. Birth weight was significantly higher (by 200 g) in the study group. When stratified by parity, significant differences in cesarean delivery rates were observed only among nulliparous women. Logistic regression analysis showed that GDM significantly increased the risk of emergency cesarean delivery (adjusted odds ratio 1.9, 95% confidence interval 1.03–3.5,  $p = 0.039$ ) only among nulliparous women, adjusted for age, body mass index, and gestational weight gain.

**Conclusion:** The incidence of emergency cesarean delivery increased significantly among nulliparous GDM pregnant women, compared with that in normal pregnant women.

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## Introduction

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy. It is one of the most common complications during pregnancy [1–3]. The incidence of GDM in Siriraj Hospital has been reported to be 2–3% of all pregnant women and 6–7% of women at risk [4].

Women with GDM are at increased risk for various maternal and fetal complications such as preeclampsia, postpartum hemorrhage and infection, birth asphyxia, stillbirth, and large for gestational age

(LGA) infants. As a consequence, the increase in LGA or macrosomic infants among GDM women could lead to an increase in operative delivery, especially cesarean delivery, for various reasons such as cephalopelvic disproportion, fetal distress, etc. Previous studies reported an increase in the cesarean delivery rate among GDM women compared with that in normal pregnant women, especially with nonelective indications [5–7].

The degree to which GDM is related to an increased rate of cesarean section is less certain. Higher rates of cesarean section may result from macrosomia associated with fetal insulin response to increased maternal glucose levels during pregnancy or changes in the obstetrical management due to the knowledge that the mother has GDM [5,6]. There is still limited information regarding the risk of emergency cesarean delivery among this group of pregnant women. The objective of this study was to determine the rate of

\* Corresponding author. Department of Obstetrics and Gynaecology, Faculty of Medicine, Siriraj Hospital, Mahidol University, Bangkok 10700, Thailand.  
E-mail address: [dittakarn.bor@mahidol.ac.th](mailto:dittakarn.bor@mahidol.ac.th) (D. Boriboonhirunsarn).

emergency cesarean section for women with gestational diabetes compared with normal pregnant women.

## Materials and methods

After ethical approval by Siriraj Institutional Review Board (No. 192/2012), a retrospective cohort study was conducted at the Department of Obstetrics and Gynecology, Faculty of Medicine, Siriraj Hospital. Term, uncomplicated, singleton pregnant women who delivered at Siriraj Hospital were enrolled. Women who were scheduled for an elective cesarean delivery, such as those with a previous cesarean section, placenta previa, transverse lie, etc., and women with overt DM were excluded. The study group consisted of 237 pregnant women who were diagnosed with GDM according to the institutional guideline [4]. Random numbers were generated to select another 237 uncomplicated, normal pregnant women who were admitted the same day as the study group cases to serve as the comparison group. Intrapartum management and decision for cesarean delivery were based on institutional practice guidelines, under staff supervision.

According to the institutional guideline, a selective screening and diagnostic scheme for GDM was offered to all pregnant women using a two-step approach [4,8]. A 50-g glucose challenge test was used to screen pregnant women at risk, and the diagnosis of GDM was based on a 100 g oral glucose tolerance test using Carpenter and Coustan [9] criteria. The process was offered during their first visit and repeated during 24–28 weeks' gestation [4]. Women who were diagnosed with GDM were offered nutritional counseling and/or insulin treatment as appropriate.

Demographic, antenatal care, intrapartum, and postpartum data were retrieved from medical records. Demographic data, antenatal care data, GDM risks, and intrapartum care data were collected. Data on route of delivery, indications for cesarean delivery, postpartum complications, and neonatal outcomes were also extracted. Prepregnancy body mass index and adequacy of gestational weight gain were classified according to the Institute of Medicine (IOM) recommendation [10].

Descriptive statistics, including number, percentage, mean, and standard deviation, was used to describe various characteristics as appropriate. Student t test and chi-square test or Fishers' exact test were used to compare various characteristics between groups. Logistic regression analysis was performed in order to determine independent risk factors for emergency cesarean delivery, adjusted for potential confounders. Adjusted odds ratio (OR) and 95% confidence interval (CI) were estimated. A p value of <0.05 was considered statistically significant.

## Results

A total of 474 pregnant women were enrolled. The study group consisted of 237 pregnant women with GDM and the comparison group 237 uncomplicated, normal pregnant women. Baseline characteristics were compared, and the results are shown in Table 1. The mean maternal age of the study group was significantly higher than that of the comparison group ( $32.7 \pm 4.8$  years vs.  $26.1 \pm 6.3$  years,  $p < 0.001$ ). The mean prepregnancy body mass index of the study group was significantly higher than that of the comparison group ( $24.0 \pm 4.4$  kg/m<sup>2</sup> vs.  $21.4 \pm 3.8$  kg/m<sup>2</sup>,  $p < 0.001$ ). Women in the study group were more likely to be overweight/obese and less likely to be underweight, compared with the comparison group ( $p < 0.001$ ). However, the mean gestational weight gain of the study group was significantly lower than that of the comparison group ( $12.7 \pm 4.7$  kg vs.  $14.0 \pm 5.0$  kg,  $p = 0.003$ ). Clinical risks for GDM are shown in Table 2. The most common factors were age >30 years and a family history of DM.

**Table 1**  
Comparison of baseline characteristics between two groups.

Characteristics	Study group (N = 237)	Comparison group (N = 237)	p
Mean age $\pm$ SD (y)	32.7 $\pm$ 4.8	26.1 $\pm$ 6.3	<0.001
Age $\geq$ 35 y	84 (35.4%)	23 (9.7%)	<0.001
Mean BMI $\pm$ SD (kg/m <sup>2</sup> )	24.0 $\pm$ 4.4	21.4 $\pm$ 3.8	<0.001
BMI category			<0.001
Underweight	16 (6.8%)	52 (21.9%)	
Normal weight	137 (57.8%)	150 (63.3%)	
Overweight/obese	84 (35.4%)	35 (14.8%)	
Mean gestational weight gain $\pm$ SD (kg)	12.7 $\pm$ 4.7	14.0 $\pm$ 5.0	0.003
Gestational weight gain category			0.318
Less than recommendation	58 (24.5%)	69 (29.1%)	
Within recommendation	98 (41.4%)	83 (35.0%)	
Greater than recommendation	81 (34.1%)	85 (35.9%)	
Parity			0.142
0	108 (45.6%)	124 (52.3%)	
1	129 (54.4%)	113 (47.7%)	

BMI = body mass index; SD = standard deviation.

**Table 2**  
Clinical risks for GDM in the study group (N = 237).

Risk factors	N (%)
Age >30 y	183 (77.2)
Family history of DM	93 (39.2)
Previous unexplained fetal death	2 (0.8)
Previous GDM	4 (1.7)
Previous macrosomic infant	0 (0)
Previous congenital fetal anomaly	1 (0.4)
Obesity (BMI > 25 kg/m <sup>2</sup> )	15 (6.3)
History of HT or gestational HT	0 (0)

BMI = body mass index; DM = diabetes mellitus; GDM = gestational diabetes mellitus; HT = hypertension.

Table 3 shows delivery results of the two groups. The rates of gestational hypertension and induction of labor were not significantly different between groups. The majority of indications for labor inductions were post-term pregnancy and term pregnancy with a favorable cervix. Although the mean gestational age at delivery were significantly greater in the study group than in the control group, the difference was without any clinical significance ( $38.4 \pm 1.1$  vs.  $38.6 \pm 1.0$ ,  $p = 0.002$ ). The emergency cesarean section rate was 31.6% in the study group and 19.4% in the control group ( $p = 0.002$ ). With regard to indication of cesarean section, women in the study group were significantly more likely to have Cephalo-pelvic disproportion (CPD) than those in the comparison group ( $p = 0.036$ ). Failed induction, among women who had labor induction, was more common in the study group than in the control

**Table 3**  
Comparison of delivery results between two groups.

Delivery results	Study group (N = 237)	Comparison group (N = 237)	p
Gestational hypertension	4 (1.7%)	1 (0.4%)	0.367
Induction of labor	43 (18.1%)	32 (13.5%)	0.166
Mean GA at delivery $\pm$ SD (wk)	38.4 $\pm$ 1.1	38.6 $\pm$ 1.0	0.002
Emergency cesarean section	75 (31.6%)	46 (19.4%)	0.002
Indication for emergency cesarean section			
CPD	49 (20.7%)	31 (13.1%)	0.036
Failed induction	9/43 (20.9%)	2/32 (6.2%)	0.142 <sup>a</sup>
Nonreassuring FHR	17 (7.2%)	13 (5.5%)	0.344

CPD = Cephalo-pelvic disproportion; FHR = Fetal heart rate; GA = gestational age; SD = standard deviation.

<sup>a</sup> Fisher's exact test.

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