OBSTETRICS

Prevalence of Gestational Diabetes Mellitus and Pregnancy Outcomes in Women with Risk Factors Diagnosed by IADPSG Criteria at Bhumibol Adulyadej Hospital

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ABSTRACT

Objective: To determine the prevalence and clinical outcomes of gestational diabetes mellitus (GDM), defined by IADPSG criteria, in pregnant women who are at risk of GDM.

Study design: Descriptive study.

Material and Method: We studied pregnant women who visited the antenatal clinics at Bhumibol Adulyadej Hospital between July 1, 2011 and December 31, 2012 and had risk factors of GDM. The diagnosis of GDM was defined using the IADPSG criteria. Primary outcome was the prevalence of GDM and the secondary outcomes were pregnancy related complications which included maternal and neonatal complications.

Results: A total of 6,324 pregnancy women, 164 patients were diagnosed GDM. The prevalence of GDM was 2.6%. The most common clinical risk factor for GDM was age ≥30 years (75.4%). The most common maternal and neonatal complication were pregnancy induced hypertension (PIH) (12.7%) and hypoglycemia (47.6%). GDM women were significantly different from non-GDM women in PIH, primary cesarean section, hypoglycemia, Apgar <7, and NICU admission. Pregnancy outcomes between GDM A1 and A2 were significantly different. GDM A2 increased the rate of cesarean section, hypoglycemia, and NICU admission.

Conclusion: Using the IADSP criteria, the prevalence of GDM was 2.6%. Compared to non-GDM regnant women, adversed pregnancy outcomes were significantly higher in GDM pregnant women.

Keywords: IADPSG criteria, gestational diabetes, pregnancy outcome

Introduction

Diabetes mellitus is the most common medical complication of pregnancy and that approximately 90% of cases are women with gestational diabetes mellitus

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(GDM). It is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy[1,2]. Diabetes in pregnancy is linked to several maternal and fetal complications and can result in substantial morbidity and mortality. These include preeclampsia, polyhydramnios, fetal macrosomia, fetal growth restriction, birth trauma, cesarean section, neonatal metabolic complication (hypoglycemia, hypocalcaemia, and hyperbilirubinemia), prematurity and perinatal mortality. Early diagnosis and treatment of GDM could avoid such adverse maternal and neonatal outcome[1, 3-5].

The prevalence of gestational diabetes is between 6-7% of the total pregnancy population[6]. At the Bhumibol Adulyadej hospital the prevalence was 0.97% years 2003-2004[7], which is surprising low. Because of various screening programs have been proposed and another reason, some high-risk pregnant women might not be screened for GDM.

In 2008, International Association of Diabetes and Pregnancy Study Groups (IADPSG) have reviewed the study of Hyperglycemia and Adverse Pregnancy outcome (HAPO) and described the criteria for diagnosis of GDM using fasting plasma glucose (FPG), 2-hr 75-grams oral glucose tolerance test (OGTT) and the prevalence of GDM was increased to 17.3%[2-3].

At Bhumibol Adulyadej Hospital, a clinical practice guideline has been changed to IADPSG criteria since July, 2011. The main objective of this study was to determine the prevalence of GDM among high-risk pregnant women. Also, pregnancy outcomes were evaluated in those who were diagnosed as GDM A1 and GDM A2.

Materials and methods

This retrospective analysis was conducted among women who attended the antenatal clinic, Department of Obstetrics and Gynecology, Bhumibol Adulyadej Hospital between July, 2011 and December, 2012. The inclusion criteria are pregnant women who met at least one clinical risk factor including: 1) first degree family history of diabetes mellitus, 2) maternal age ≥30 years old, 3) hypertension, 4) obesity and overweight (body mass index ≥27 kg/m^2),

5) polyhydramnios (AFI >25 cm), 6) pregnancy induced hypertension (PIH), 7) excessive weight gain, 8) patient with previous history of macrosomia, 9) congenital fetal anomaly, 10) unexplained intrauterine fetal death, 11) glucosuria by urine strip, or 12) GDM during previous pregnancy. Those who were diagnosed diabetes mellitus before pregnancy and those who did not follow the diagnostic guideline will be excluded. Antenatal records were reviewed and data were extracted including baseline characteristics, data on clinical risk factors, classification of GDM, gestational age at detection, treatment received, and antenatal complications. Labor and delivery records were also reviewed regarding to intrapartum and postpartum maternal complications, as well as various neonatal complications. This study has been reviewed and approved by Ethics Committee, Bhumibol Adulyadej Hospital.

Diagnosis of GDM

- Pregnancies <24 weeks of gestation
  - Fasting plasma glucose (FPG) ≥92 mg/dl, but <126 mg/dl at any gestational age (FPG ≥126 mg/dl is consistent with overt diabetes).
  - When overt diabetes or GDM has not been diagnosed with initial testing at the first prenatal visit, 75-grams two hours OGTT should be administered at 24-28 weeks of gestation to all patients.
- Pregnancies ≥24 weeks of gestation
  - 75-grams two hours OGTT with at least one abnormal result: FPG ≥92 mg/dl, but <126 mg/dl at any gestational age (FPG ≥126 mg/dl is consistent with overt diabetes) or one hour ≥180 mg/dl or two hours ≥153 mg/dl.
- Diagnosis of GDMA1 and GDMA2
  - GDM A1: FPG <105 mg/dl and 2 hr Postprandial <120 mg/dl
  - GDM A2: FPG ≥105 mg/dl or 2 hr Postprandial ≥120 mg/dl
- Management of GDM
  - GDMA1 were treated with dietary therapy
  - GDMA2 were treated with dietary and insulin therapy

o Follow up schedules were assigned individually as appropriate, depending on gestational age, blood glucose level control and other complications

Statistical analysis

Data were analyzed and expressed as numbers and percentages. The Chi-square test and Fisher's exact test were used to compared between GDM versus control, GDM class A1 versus A2, respectively. Primary outcome was the prevalence of GDM and the secondary outcomes were pregnancy related complications. P value <0.05 were considered to be significant.

Results

Prevalence of GDM

From the 6324 pregnant women, 649 women were at risk of GDM using the IADPSG criteria. Out of 649 women, 164 women (2.6%) were diagnosed GDM, thus remaining was classified into non-GDM group (Fig. 1). The older maternal age, the higher proportion of GDM, especially older than 35 years old (46.8%) as well as multiparous (74.6%) (Table 1). These women visited the ANC more than 11 times (46.8%). Three cases had history of thyroid disease and one case had history of asthma.
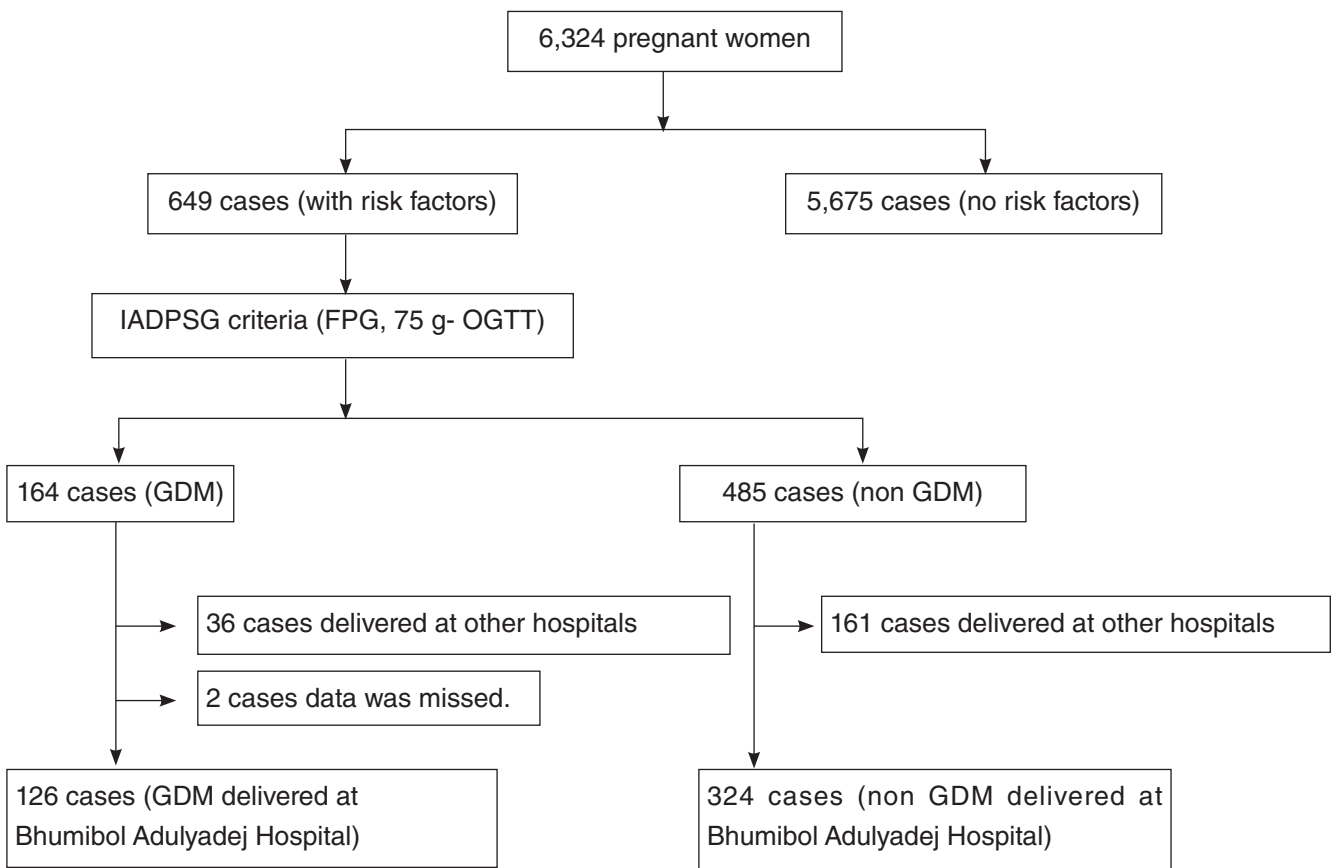
Fig. 1. Flow chart

Table 1. Demographic characteristics of GDM women.

Characteristics	N (%)
Age	
<25	13(10.3)
≥25-29	18(14.3)
30-34	36(28.6)
≥35	59(46.8)
Parity	
1	32(25.4)
≥2-3	86(68.3)
≥4	8(6.34)
Number of ANC	
1-3	2(1.6)
4-6	9(7.1)
7-10	56(44.4)
≥11	59(46.8)
Medical complication	
Hyperthyroidism	3(2.4)
Asthma	1(0.8)

Prevalance of risk factors of GDM

Compared to non-GDM pregnant women, the pregnant women with GDM had significantly higher proportion of age ≥30 years old (p=0.014), glucosuria, BMI ≥27 kg/m^2 (p<0.001), history of glucosuria by urine strip (p<0.001) and excessive weight gain (p<0.001) (Table 2).

Table 2. Clinical risk factors for gestational diabetes mellitus.

Clinical risk factors	GDM	Non GDM	p*
	N=126(%)	N=324(%)	
Maternal age ≥30 years old	95(75.4)	204(62.96)	0.014*
Family history of diabetes mellitus	27(21.4)	60(18.51)	0.507
Previous history of gestational diabetes mellitus	2(1.6)	4(1.23)	1.00
Previous history of macrosomia	3(2.4)	2(0.62)	0.0136
Previous history of congenital anomaly	0	0	NS
Previous history of unexplained fetal death	0	0	NS
BMI ≥27 kg/m^2	41(32.5)	44(13.58)	<0.001
Pregnancy induced hypertension	1(0.8)	0	0.28

Table 2. Clinical risk factors for gestational diabetes mellitus. (Cont.)

Clinical risk factors	GDM	Non GDM	p*
	N=126(%)	N=324(%)	
History of glucosuria by urine strip	56(44.4)	69(21.30)	<0.001*
Excessive weight gain	4(3.2)	49(15.12)	<0.001*
Polyhydramnios (AFI ≥25)	1(0.8)	0	0.28

Data were analyzed using Chi-square and Fisher's exact test. *p-value less than 0.05.

Of 126 women of GDM delivered at Bhumibol Adulyadej Hospital, 100 women were diagnosed GDM at gestational age >24 weeks (79.4%). Majority of the pregnant women were GDM class A1 (n=106, 84.1%) and only 20 cases (15.9%) were in GDM class A2.

Labor and delivery

Most pregnant women delivered at term (GA ≥37 weeks) (n=105, 83.3%), remaining 68 cases were delivered by cesarean section (53.8%) (Table 3).

Table 3. Data on labor and delivery.

Characteristics	N (%)
GA at delivery	
Preterm (<37 weeks)	21(16.7)
Term (≥37 weeks)	105(83.3)
Mode of delivery	
Normal labor	54(42.9)
Cesarean section	68(54.0)
Vacuum extraction	4(3.2)

Pregnancy complications

The most common maternal complication was PIH (n=16, 12.7%). The most neonatal complication was hypoglycemia (n=60, 47.6%), followed by neonatal jaundice (n=59, 46.8%), NICU admission (n=23, 18.3%), large for gestational age (LGA) (n=4, 3.2%), and Apgar score <7 at 5 minutes (n=3, 2.4%) (Table 4).

Compared to non-GDM pregnant women, the pregnant women with GDM had significantly higher proportion of PIH (p<0.001) and in non-GDM pregnant women had higher proportion of primary cesarean section (p<0.05) (other factors rather than GDM could be the indication for cesarean section such as failure to progress, non-reassuring fetus and fetal distress).

The newborns who were delivered from GDM pregnant women had a higher proportion of neonatal hypoglycemia (p<0.001), NICU admission (p<0.001), and Apgar <7 (p=0.022), compared to the newborns who were delivered from non-GDM pregnant women. There were no shoulder dystocia and birth passage injury in both group (Table 5).

In addition, comparison between GDM class A1 and A2, the proportion of cesarean section, neonatal hypoglycemia, and NICU admission were significantly higher in GDM class A2 (p<0.05). Other pregnancy complications were not significantly different between two patient groups (Table 6).

Table 4. Pregnancy outcomes

Pregnancy outcomes	N (%)
Maternal complications	
Pregnancy induced hypertension (PIH)	16(12.7)
Polyhydramnios (AFI ≥25)	1(0.8)
Complication of delivery	
Shoulder dystocia	0
Birth passage injury	0
Cesarean section (primary)	21(16.7)
Neonatal complications	
Neonatal hypoglycemia	60(47.6)
Neonatal jaundice	59(46.8)
Size of newborn	
Appropriate for gestational age	112(88.9)
Small for gestational age	10(0.8)
Large for gestational age	4(3.2)
Apgar score at 5 minutes	
≥7	123(97.6)
<7	3(2.4)
NICU admission	23(18.3)
Neonatal death	0

Table 5. Comparison of pregnancy outcomes between GDM and non-GDM women.

Complications	GDM	Non GDM	p*
	N=126(%)	N =324(%)	
Pregnancy induced hypertension (PIH)	16(12.7)	12(3.7)	<0.001*
Polyhydramnios (AFI ≥25)	1(0.8)	0	0.28
Complication of delivery			
Shoulder dystocia	0	0	NS
Birth passage injury	0	0	NS
Primary Cesarean section	21(16.7)	142(43.8)	<0.001*
LGA	4(3.2)	10(3.1)	1
Low Apgar score at 5 minutes (<7)	3(2.4)	2(0.6)	0.022*
Neonatal hypoglycemia	60(47.6)	26(8.0)	<0.001*
Neonatal hyperbilirubinemia	59(46.8)	139(42.9)	0.45
NICU admission	23(18.3)	15(4.6)	<0.001*

Data were analyzed using Chi-square and Fisher's exact test. *p-value less than 0.05.

Table 6. Comparison of pregnancy outcomes between GDM class A1 and GDM class A2.

Complications	GDM class A1 N=106 (%)	GDM class A2 N=20 (%)	p*
PIH	11(10.38)	5(25)	1
Polyhydramnios (AFI ≥25)	1(0.79)	0	1.59
Complication of delivery			
Shoulder dystocia	0	0	-
Birth passage injury	0	0	-
Primary Cesarean section	17(16.04)	4(20)	0.043*
LGA	4(3.17)	0	0.33
Low Apgar score at 5 minutes (<7)	1(0.8)	2(10)	1
Neonatal hypoglycemia	51(48.1)	9(45)	0.008*
Neonatal hyperbilirubinemia	50(47.2)	9(45)	0.47
NICU admission	18(17.0)	5(25)	0.023*

Data were analyzed using Chi-square and Fisher's exact test. *p-value less than 0.05.

Discussion

GDM is one of the most common pregnancy complications that affects about 6-7% of all pregnant women[6]. Early diagnosis and appropriate treatment could improve the prognosis and prevent associated morbidity and mortality of these pregnant women and their newborn infants.

The diagnosis of GDM in the present study was based on the IADPSG criteria and the prevalence was 2.6%. The prevalence has been reported variably from 1.4-14% worldwide and different among racial and ethnic groups. Prevalence is higher in Blacks, Latino, Native Americans and Asian women than in the White women[8]. The prevalence of GDM at Bhumibol Adulyadej Hospital increased from the previous study[9]. According to the HAPO study, they found a prevalence rate of 24%[2] while study in Ireland by O'Sullivan EP et al, demonstrated prevalence of 12.4%[10]. However, one study in India by Priyanka K et al, observed the prevalence of 6.6 %, which was different from our study. Thus, GDM is likely multifactorial in origin and different in genetic predisposition may be involved[11]. In addition, this study, we included only the high risk pregnant women for screening and this may cause the prevalence of GDM lower than the other studies.

In this study the most common clinical risk for GDM was maternal age ≥30 years old (Table 2). This result aligns to one report by Boriboonhirunsarn D et al, studied at Siriraj Hospital[5]. They also revealed that glucosuria, BMI ≥27 kg/m², family history of diabetes were important risk factors for the development of GDM. Study by Boriboonhirunsarn D et al, also showed similar results in family history of diabetes and obesity[5]. However, Hirst JE et al, demonstrated the litter obese in pregnant women (4.7%)[12]. Differences might be due to the differences in patient's characteristics and conditions in each population.

Our study revealed the most common maternal complication was PIH (12.7%). Boriboonhirunsarn D et al, found that the most common maternal complication seen in GDM mothers was postpartum hemorrhage (10.5%) followed by mild and severe preeclampsia[4]. Another study of 972 GDM mothers in Saudi Arabia showed that the common complications were perineal tear (18%) caused postpartum hemorrhage, followed by gestation hypertension (2%)[13].

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The most common neonatal complication found in our study was hypoglycemia (47.62%). Briboonhirunsarn D et al, found hypoglycemia incidence of 68.5%[5]. Most studies showed that fetal macrosomia occurred about 10-20% of infant with GDM mothers. Our study demonstrated 3.17% of infants with mothers were LGA. It was lower than the incidence of Boriboonhirunsarn D et al (17.9%)[5] and Kalra P et al (18%)[8]. However, infants' size related information (such as glycemic control or dietary control) was limited due to the nature of retrospective analysis.

We also found that, compared to non-GDM group, GDM patients had a higher proportion of PIH, LGA, low Apgar score at 5 minutes (<7), hyperbilirubinemia and NICU admission. One reason of NICU admission was neonatal hypoglycemia since our hospital had no intermediate ward.

This study had some limitations. Because of the small sample size in GDM A2 patient group, comparison of GDM A1 and A2 may be difficult to interpret. In addition, our study lack of information on glycemic control that might affect both maternal and neonatal outcomes. Also, this study we excluded the pregnant women with a low risk to GDM; however some risk factors in low risk pregnancy may provoke GDM and this may affect to our analysis. A further prospective study with more appropriate and accurate data should be conducted to better clarify and provide more information.

Conclusion

Using the IADPSG criteria, the prevalence of GDM at Bhumibol Adulyadej Hospital was 2.6%. Compared to non-GDM pregnant women, the pregnant women with GDM had significantly higher proportion of PIH and had less proportion of primary cesarean section. Also, the newborns who were delivered from GDM pregnant women had a higher proportion of neonatal hypoglycemia, NICU admission, and Apgar <7, compared to the newborns who were delivered from non-GDM pregnant women.

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ความชุกและผลลัพธ์ของโรคเบาหวานระหว่างการตั้งครรภ์ในสตรีตั้งครรภ์ที่มีความเสี่ยง วินิจฉัยตามเกณฑ์การวินิจฉัย International Association of Diabetes and Pregnancy Study Groups (IADPSG) ที่โรงพยาบาลภูมิพลอดุลยเดช

กาญจนา กันธิยะ, วิยะดา เหลืองด่านสกุล, เพชร วัชรสินธุ์, สินาท พรหมมาศ, บุปผา สมานชาติ

วัตถุประสงค์ : *เพื่อศึกษาความชุกของโรคเบาหวานระหว่างการตั้งครรภ์ในสตรีตั้งครรภ์ที่มีความเสี่ยงตามเกณฑ์การวินิจฉัย International Association of Diabetes and Pregnancy Study Groups (IADPSG) และเพื่อศึกษาผลลัพธ์ของโรคเบาหวานระหว่างการตั้งครรภ์ที่โรงพยาบาลภูมิพลอดุลยเดช*

ชนิดของการวิจัย : *การวิจัยเชิงพรรณนา*

วัสดุและวิธีการ : *ผู้วิจัยได้ทำการเก็บข้อมูลสตรีตั้งครรภ์ที่มีความเสี่ยงต่อการเกิดโรคเบาหวานระหว่างตั้งครรภ์ (ตามเกณฑ์การวินิจฉัยของ IADPSG) ซึ่งได้มาฝากครรภ์ ที่ร.พ.ภูมิพลอดุลยเดช ตั้งแต่วันที่ 1 กรกฎาคม 2554 ถึงวันที่ 31 ธันวาคม 2555 จำนวน 649 ราย โดยตรวจวัดอุบัติการณ์และผลลัพธ์ของโรคเบาหวานระหว่างการตั้งครรภ์*

ผลการวิจัย : *สตรีตั้งครรภ์ที่มาฝากครรภ์ในช่วงระยะเวลาที่กำหนดทั้งหมด 6,324 ราย และได้รับการตรวจโดยใช้เกณฑ์ IADPSG พบ 164 ราย วินิจฉัยว่าเป็นโรคเบาหวานระหว่างการตั้งครรภ์ คิดเป็นความชุกร้อยละ 2.6 ปัจจัยเสี่ยงจากการศึกษานี้ คือ อายุส่วนใหญ่ของสตรีตั้งครรภ์ที่เป็นโรคเบาหวานระหว่างตั้งครรภ์ ≥30 ปี (75.4%) ผลลัพธ์จากสตรีตั้งครรภ์ที่เป็นโรคเบาหวานพบว่า สตรีตั้งครรภ์เป็นโรคความดันโลหิตสูงระหว่างตั้งครรภ์ร้อยละ 12.69 และทารกมีภาวะน้ำตาลต่ำร้อยละ 47.6 เมื่อเปรียบเทียบสตรีตั้งครรภ์ที่เป็นโรคเบาหวานกับสตรีที่ไม่ได้เป็นโรคเบาหวาน พบว่าภาวะความดันโลหิตสูงระหว่างการตั้งครรภ์ การผ่าตัดคลอด ทารกหลังคลอดพบมีภาวะน้ำตาลต่ำ Apgar <7 และได้รับการรักษาในหอผู้ป่วยหนักกุมาร แตกต่างกันอย่างมีนัยสำคัญ และจากการเปรียบเทียบผลลัพธ์ที่เกิดขึ้นพบโรคเบาหวานระหว่างการตั้งครรภ์ชนิด A2 แตกต่างกับชนิด A1 อย่างมีนัยสำคัญคือ การผ่าตัดคลอด ทารกหลังคลอดพบมีภาวะน้ำตาลต่ำ และได้รับการรักษาในหอผู้ป่วยหนักกุมาร*

สรุป : *จากการใช้เกณฑ์การวินิจฉัยของ IADPSG การวิจัยนี้พบความชุกของโรคเบาหวานในสตรีตั้งครรภ์เพิ่มขึ้น และผลลัพธ์ของโรคเบาหวานระหว่างการตั้งครรภ์ชนิด A1 และ A2 มีความแตกต่างกันอย่างมีนัยสำคัญ*

คำสำคัญ : *เกณฑ์การวินิจฉัยโรคเบาหวานระหว่างตั้งครรภ์ที่ใช้ในโรงพยาบาลภูมิพลอดุลยเดช, สตรีตั้งครรภ์ที่เป็นโรคเบาหวานระหว่างการตั้งครรภ์, ผลลัพธ์ที่เกิดขึ้นจากโรคเบาหวานระหว่างตั้งครรภ์*

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