Risk Factors for Early Diagnosis of Gestational Diabetes Mellitus

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Objective : *To determine factors possibly associated with early development of GDM (before 24 weeks of gestation)*
Subjects : *A total of 196 pregnant women who were at risk for GDM and started antenatal care at antenatal clinic before 24 weeks of gestation, Siriraj Hospital between January 2002 and December 2002 were enrolled. Those who were known cases of DM before pregnancy were excluded.*
Method : *Screening test with 50 g GCT was offered to all participants at their first visits and 100g OGTT was used as a diagnostic test. If GDM was not diagnosed, they were retested between 28-32 weeks using the same criteria. Early GDM was defined as the diagnosis of GDM before 24 weeks of gestation. Late GDM was defined as the diagnosis of GDM later than 24 weeks of gestation. Clinical risk factors of the 2 groups were compared to determine the association with early development of GDM.*
Results : *Of 196 women with GDM, 127 (64.5%) were diagnosed before 24 weeks of gestation, and 69 (35.5%) were diagnosed later. Obesity was only one significant risk factor for early development of GDM. Early GDM group were more likely to be obese than late GDM group (20.5% and 8.7% respectively, p=0.042). Other clinical risks were not significantly different between the 2 groups. Early GDM were more likely to diagnose if 3 or more clinical risk factors were found compared to late GDM group (8.75% and 2.9% respectively) but not significantly different.*
Conclusion : *Obese women (BMI e" 27 kg/m^2) should attend the screening program at early pregnancy to reduce maternal complications and adverse neonatal outcomes.*

Keywords : *Clinical risk factors, Gestational diabetes mellitus, Early diagnosis*

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Diabetes mellitus is one of the most common medical complications in pregnant women. Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy[1]. The incidence of GDM has been reported to range between 1-16%[2]. Women with diabetes are at great risk for number of pregnancy-related complications, including preterm labour, infectious morbidity, hydramnios, and hypertensive disorders. The infants born to women with diabetes are also increased risk for a variety of neonatal morbidities, including congenital malformation, macrosomia which sometimes causes difficulties in delivery resulting in asphyxia or injury, respiratory distress syndrome which is more frequent and severe than would be expected from the degree of prematurity, neonatal hyperbilirubinemia and hypoglycemia[3-7].

Screening program of pregnant women for GDM in Siriraj Hospital has been developed using a selective screening process, based on history and clinical risk factors for GDM as shown in Table 1. A 50 g glucose challenge test (50 g GCT) is used as a screening method and 100 g oral glucose tolerance test (100 g OGTT) is used as a confirmatory test.

Since early treatment to control blood sugar is necessary to reduce maternal and fetal complication. Therefore, early diagnosis of GDM in every woman is crucial, especially those who were at risk. The study

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was aimed to determine factors possibly associated with early development of GDM (before 24 weeks of gestation).

Material and Method

The study was conducted between January and December 2002. Pregnant women who attended the antenatal clinic at Siriraj Hospital before 24 weeks of gestation and had at least 1 clinical risk factor were eligible. Clinical risks for GDM are shown in Table 1[8]. Those who were known cases of DM before pregnancy were excluded. Only those who were diagnosed with GDM were recruited.

Screening test with 50 g GCT was offered at their first visit and those with abnormal results ($\geq$ 140 mg/dl) were confirmed the diagnosis of GDM with 100 g OGTT. Diagnosis of GDM requires that at least two of four glucose level of the100 g OGTT meet or exceed the upper limit of normal. The cut off values for fasting 1, 2and 3 hours blood glucose are $\geq$ 105, 190, 165,and 145 mg/dl respectively[9]. If GDM was not diagnosed, all women were retested between 28-32 weeks using the same methods as the first visit[9].

Data on clinical risk factors, gestational age at first visit and at the time of diagnosis were extracted from medical records. Early GDM was defined as the diagnosis of GDM before 24 weeks of gestation. Late GDM was defined as the diagnosis of GDM later than 24 weeks of gestation.

The two groups were then compared with regard to clinical risk factors to determine whether there is any association. Descriptive statistics were used to describe patient's clinical risk profile and Chi-square test was used in the comparison between the two groups. A p value of <0.05 was considered statistical significance.

Table 1. Clinical risk factor for GDM in Siriraj Hospital [7]

Criteria for pregnant women needing selective screening for gestational diabetes
Family history of diabetes mellitus
Age $\geq$ 30 years
Previous history of macrosomia
Previous history of congenital fetal anomaly
Previous history of unexplained intrauterine fetal death
Previous history of gestational diabetes during previous pregnancy
Hypertension
Obesity (body mass index $\geq$ 27 kg/m^2)

Results

Between January and December 2002, a total of 196 from 3580 pregnant women who had clinical risk factor for GDM and early attended screening program for GDM who were diagnosed with GDM were enrolled. Mean gestational age at first visit was 12.6$\pm$4.5 weeks.

Table 2 shows the clinical risk profile of 196 women. The most common clinical risk was age $\geq$ 30 years (76.5%), family history of DM and previous macrosomia infants were found in 44.4% and 3.6% respectively. Obesity was found in 16.3% of the women.

Most of the women had only 1 clinical risk (61.7%) and less than 7% had 3 clinical risks or more, as shown in Table 3.

Of 196 women, 127 (64.5%) were classified as early GDM and the other 69(35.5%) were classified as late GDM. Among late GDM group , 29 had normal 50 g GCT and 40 had abnormal 50 g GCT but normal 100 g OGTT. Mean gestational age at diagnosis were 13.1 $\pm$ 4.3 week and 30.7 $\pm$ 3.9 weeks respectively.

Table 4 shows comparison of clinical risk between early and late GDM groups. Early GDM group were more likely to be obese than late GDM group (20.5% and 8.7% respectively, p=0.042). Other clinical risks were not significantly different between the 2 groups.

Table 2. Number of clinical risk factors for GDM women

Clinical risk factors	Number of cases (%)
Maternal age $\geq$ 30 years	150 (76.5%)
Family history of diabetes mellitus	87 (44.4%)
Obesity	32 (16.3%)
Previous history of macrosomia	7 (3.6%)
Previous history of GDM during previous pregnancy	6 (3.1%)
Previous history of unexplained fetal death	3 (1.5%)
Hypertension	2 (1%)
Previous history of congenital malformation	1 (0.5%)

* Women may have more than one clinical risk factor

Table 3. Proportion of women with different number of clinical risks

No. of clinical risk	Number	%
1	121	61.7
2	62	31.6
$\geq$3	13	6.6

Table 4. Comparison clinical risks between early and late diagnosis of GDM

Clinical risk factor	Early diagnosis N = 127	Late diagnosis N = 69	P value
Family history of diabetes mellitus	56 (44.1%)	31 (44.9%)	1.000
Maternal age ≥ 30 years	101 (79.5%)	49 (71%)	0.217
Previous history of macrosomia	5 (3.9%)	2 (2.9%)	1.000
Previous history of congenital malformation	0 (0%)	1 (1.4%)	0.352
Previous history of unexplained fetal death	1 (0.8%)	2 (2.9%)	0.283
Hypertension	1 (0.8%)	1 (1.4%)	1.000
Previous history of GDM during previous pregnancy	5 (3.9%)	1 (1.4%)	0.667
Obesity	26 (20.5%)	6 (8.7%)	0.042

Table 5 shows that early GDM were more likely to diagnose if 3 or more clinical risk factors were found compared to late GDM group (8.75% and 2.9% respectively) but not significantly different.

Discussion

Although gestational diabetes affects as many as 5% of all pregnant women[10], specific aspects of obstetrics and prenatal risks in this population have not been clearly delineated. Successful screening program could lead to early diagnosis and treatment, which could improve the prognosis and prevent morbidity and mortality of these pregnant women and their newborn infants. The clinical practice guideline for GDM screening and diagnosis has been developed in our institute and implemented since January 2000.

Untreated GDM has been reported to be associated with significant neonatal morbidity[11]. Appropriate treatment will result in decreased neonatal adverse outcome comparable to general population rates therefore, early diagnosis is important to every pregnant woman. They will benefit from early intervention and treatment that will result in good perinatal outcomes and reduce the maternal and fetal complication such as unexplained fetal death, congenital anomaly, preterm delivery, hydramnios, macrosomia and maternal metabolic complications.

Table 5. Comparison between early and late diagnosis of GDM with different number of clinical risk factors

Number of clinical risk	Early diagnosis N = 127	Late diagnosis N = 69	P value
1	73 (57.5%)	48 (69.6%)	
2	43 (33.9%)	19 (27.5%)	0.145
≥3	11 (8.75%)	2 (2.9%)	

In this study, the only significant clinical risk factor for early diagnosis of GDM was obesity. Other clinical risk factors were not significant. We also found that those with more than 1 risk were more likely to develop GDM at early onset but not statistical significant.

Clinical risk factors that were investigated in this study have been previously verified to be associated with development of GDM. The study in our institute reported that every risk factor increased the chance, of varying degree, for GDM and the number of risks was also related to probability of GDM[8].

In conclusion, early glucose intolerance screening could avoid some diabetes-related complication such as hydramnios, fetal anomalies and preterm births in women diagnosed as having gestational diabetes. However, the obese women should attend the screening program at early onset to receive appropriate screening and diagnosis in order to minimize maternal complication and neonatal adverse effects[12,13].

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ปัจจัยเสี่ยงสำหรับการวินิจฉัยภาวะเบาหวานในสตรีตั้งครรภ์ระยะแรก

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วัตถุประสงค์ *: เพื่อประเมินปัจจัยเสี่ยงที่มีสัมพันธ์ร่วมกับภาวะเบาหวานขณะตั้งครรภ์ที่วินิจฉัยได้ก่อน 24 สัปดาห์*
กลุ่มตัวอย่าง *: สตรีตั้งครรภ์ที่ไม่มีภาวะเบาหวานก่อนการตั้งครรภ์ 196ราย ที่มีภาวะเสี่ยงทางคลินิกต่อการเกิดภาวะเบาหวานขณะตั้งครรภ์ ซึ่งเริ่มฝากครรภ์ ที่หน่วยฝากครรภ์ โรงพยาบาล ศิริราชตั้งแต่อายุครรภ์ก่อน 24 สัปดาห์ ระหว่างเดือน มกราคม 2545 ถึง เดือน ธันวาคม 2545*
การกระทำ *: ผู้เข้าร่วมการศึกษาทุกรายจะได้รับการตรวจคัดกรองด้วยวิธี 50g GCT เมื่อมารับการฝากครรภ์ครั้งแรก และได้รับการตรวจยืนยันโดยวิธี 100 g OGTT ถ้าการตรวจคัดกรองผิดปกติ ถ้าการตรวจครั้งแรกปกติ ผู้เข้าร่วมการศึกษาจะได้รับการตรวจซ้ำอีกครั้ง ระหว่างอายุครรภ์ 28-32 สัปดาห์ ภาวะเบาหวานระหว่างตั้งครรภ์ที่วินิจฉัยได้เร็ว หมายถึง การวินิจฉัยได้ก่อนอายุครรภ์ 24 สัปดาห์ ส่วนภาวะเบาหวานระหว่างตั้งครรภ์ที่วินิจฉัยได้ช้า หมายถึง การวินิจฉัยได้หลังอายุครรภ์ 24 สัปดาห์ ปัจจัยเสี่ยงทางคลินิกของทั้งสองกลุ่มจะถูกนำมาเปรียบเทียบเพื่อค้นหาปัจจัยเสี่ยงที่มีสัมพันธ์กับการเกิดภาวะเบาหวานระหว่างตั้งครรภ์ที่วินิจฉัยได้เร็ว*
ผลการวิจัย *: สตรีที่มีภาวะเบาหวานระหว่างตั้งครรภ์จำนวน 196 ราย พบว่าวินิจฉัยก่อนอายุครรภ์ 24 สัปดาห์ จำนวน 127 ราย (64.5%) และได้รับการวินิจฉัยหลัง 24 สัปดาห์ จำนวน 69 ราย (35.5%) ภาวะอ้วน เป็นปัจจัยเสี่ยงเพียงภาวะเดียวที่มีนัยสำคัญ ต่อการเกิด ภาวะเบาหวานในสตรีตั้งครรภ์ที่วินิจฉัยได้เร็ว โดยพบว่ากลุ่มที่วินิจฉัยได้ก่อน 24 สัปดาห์ จะมีภาวะอ้วนมากกว่ากลุ่มที่วินิจฉัยได้หลัง 24 สัปดาห์ (20.5% และ8.7% ตามลำดับ,p=0.042) ขณะที่ปัจจัยอื่นๆ ไม่พบความแตกต่างกันระหว่างกลุ่มศึกษาทั้งสองกลุ่ม กลุ่มที่สามารถวินิจฉัยได้ก่อน 24 สัปดาห์ พบว่ามีปัจจัยเสี่ยงมากกว่าหรือเท่ากับ 3 ปัจจัยเสี่ยง เมื่อเปรียบเทียบกับกลุ่มที่วินิจฉัยได้หลัง 24 สัปดาห์ (8.75% และ 2.9%ตามลำดับ) แต่ไม่พบความแตกต่างกันทางสถิติ*
ข้อสรุป *: สตรีที่มีภาวะอ้วน (ดัชนีมวลกาย ≥ 27 กก/ม ^{2}) ควรได้รับการตรวจคัดกรองและวินิจฉัยภาวะเบาหวานระหว่างตั้งครรภ์ ตั้งแต่ในระยะแรกของการตั้งครรภ์เพื่อลดภาวะแทรกซ้อนต่อมารดาและบุตร*