Incidence of Large-for-Gestational Age Newborn: A Comparison between Pregnant Women with Abnormal and Normal Screening Test for Gestational Diabetes

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Objective: *To evaluate the incidence of large-for-gestational age (LGA) newborn between pregnant women with abnormal and normal glucose challenge test (GCT).*
Design: *Retrospective cohort study.*
Material and Method: *Two hundred and sixty pregnant women, who were at risk for gestational diabetes mellitus (GDM), received screening following practice guideline. The women were divided into two groups. The study group comprised of 130 women whose screening test results of 50-g 1-hour GCT were abnormal but had not been diagnosed with GDM (normal oral glucose tolerance test). The control group comprised of 130 women whose GCT results were normal. Comparison of various maternal and neonatal characteristics as well as the incidence of LGA between the groups was made.*
Results: *There were no significant differences in age, gestational age at first antenatal care, body mass index, and risk of GDM between the two groups. The study group had a significantly higher number of parity and number of risk factors of GDM than the control group. There was no significant difference in the incidence of LGA newborn between the two groups (8.5% in the study group and 10.8% in the control group, p = 0.528). There were also no significant differences in gestational age at delivery, pre-eclampsia, pre-term delivery, hyperbillirubinemia of the newborn between the two groups. There were no cases of maternal acute postpartum hemorrhage, and birth asphyxia.*
Conclusion: *The incidence of LGA newborn was similar between non-GDM women with abnormal and normal screening GCT results in Siriraj Hospital.*

Keywords: *Gestational diabetes mellitus, Large-for-gestational age newborn, Glucose challenge test*

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Gestational diabetes mellitus (GDM) is defined as glucose tolerance with the onset or first detection during pregnancy. Pregnancy is diabetogenic condition characterized by insulin resistance with a compensatory increase in B-cell response and hyperinsulinemia. Insulin resistance usually begins in the second trimester and progresses throughout the remainder of pregnancy. Placental secretion of hormones such as progesterone, cortisol, placental lactogen, prolactin, and growth hormone is a major cause of the insulin-resistant state seen in pregnancy.

Women with GDM are related with the increased incidence of fetal macrosomia, caesarean section, pre-eclampsia, and perinatal mortality[1-3]. A previous study demonstrated that even the increased glucose intolerance during pregnancy in women without GDM also increased the risk of macrosomia, cesarean section, pre-eclampsia, and requirement for NICU admission[4,5].

A previous study has reported that the incidence of large-for-gestational-age (LGA) newborns was significantly higher among women with abnormal

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screening test results, and these newborns had a significantly higher rate of shoulder dystocia than those with normal screening results[6].

The objective of the present study was to evaluate the incidence of LGA newborns among pregnant women with abnormal screening test results of GDM compared with those with normal test results.

Material and Method

A retrospective cohort study was conducted at the Department of Obstetrics and Gynecology, Faculty of Medicine Siriraj Hospital. The sample size was calculated based on the incidence of LGA in women with normal screening test results (10%) and in women with abnormal test results but had not been diagnosed with GDM (25%) from a pilot study. At least 101 women in each group were required with 80% power and 95% confidence level.

The present study recruited 260 pregnant women who were at risk for GDM but had not been diagnosed with GDM. All women received screening and diagnostic tests for GDM according to clinical practice guideline used at Siriraj Hospital[7].

Pregnant women who were at risk for GDM were screened by 50-g 1-hour glucose challenge test (GCT) and those with abnormal results ($\geq$ 140 mg/dl) were tested with 100-g 3-hour oral glucose tolerance test (OGTT) for diagnosis of GDM. The cut off values for fasting, 1, 2, and 3 hours blood glucose are $\geq$ 105, 190, 165, and 145 mg/dl respectively. The test scheme was offered during their first visit and repeated during 24-28 weeks of gestation if initial tests were normal.

Pregnant women who did not receive a screening test before GA 24 weeks, and those diagnosed with GDM were excluded. The study group comprised of 130 women whose screening test results of 50-g 1-hour GCT were abnormal in either period but had not been diagnosed with GDM (normal 100-g OGTT results). The control group was comprised of 130 women whose GCT results were normal in both periods.

Data analysis

Data collection included baseline characteristics, clinical risks for GDM, labor and delivery data, and pregnancy and neonatal outcomes. LGA was diagnosed when birth weight was equal to or greater than 90th percentile of normal infants.

The two groups were then compared with regard to various baseline and obstetric characteristics and incidence of LGA. Pregnancy and neonatal outcomes were also compared. Descriptive statistics were used to describe the patient's characteristics. Student t-test and Chi-square test or Fishers' Exact test were used in the comparison between the two groups where appropriate. A p value of < 0.05 was considered statistical significance.

The present study has been reviewed and approved by the Ethics Committee, Faculty of Medicine Siriraj Hospital, Mahidol University.

Results

Two hundred and sixty pregnant women, who met the inclusion and exclusion criteria, were recruited; 130 in the control group and another 130 in the study group.

Table 1 shows baseline maternal characteristics between the two groups. There was no significant difference between the groups in maternal age and GA at first ANC. However, the control group had a significantly higher proportion of nulliparous women than the study group (52.3% and 37.7% respectively, $p = 0.018$).

Both groups were comparable with regard to clinical risk factors of GDM as shown in Table 2. Obese women in both groups were similar. However, women in the study group had significantly more clinical risks than the control group ($p = 0.01$).

Table 3 shows the comparison of pregnancy outcomes and complications between the two groups. There were no significant differences of GA at delivery ($p = 0.788$) and incidence of pre-eclampsia ($p = 0.09$). No acute postpartum hemorrhage (PPH) was found in both groups. The rate of cesarean delivery was also similar in both groups ($p = 0.25$).

Neonatal outcomes in both groups are shown in Table 4. The incidence of LGA newborn between the study and control group showed no significant difference (8.5% and 10.8% respectively, $p = 0.528$) and no small for gestational age (SGA) newborn was observed in both groups. There was no case of severe birth asphyxia in both groups. No significant differences were found in the incidence of hyperbillirubinemia.

Discussion

Previous studies have shown that pregnant women with GDM had a higher incidence of fetal macrosomia, birth trauma, and rate of caesarean section than in the non-GDM pregnant women[1-3]. The relation of this condition was also found in non-GDM pregnant women who had carbohydrate intolerance. A previous study reported that increasing carbohy-

Table 1. Characteristics of the pregnant women (n = 260)

Characteristics	Study group n = 130	Control group n = 130	p-value
Age (years)	30.98 ± 4.9	29.79 ± 6.5	0.101
GA at first ANC (weeks)	11.38 ± 4.4	12.48 ± 4.8	0.060
Nulliparity	49 (37.7%)	68 (52.3%)	0.018

Table 2. Comparison of risk factor of GDM

Risk factor	Study group n = 130	Control group n = 130	p-value
Family history of DM	61 (49.6%)	54 (41.5%)	0.382
Age ≥ 30 years	88 (67.7%)	82 (63.1%)	0.434
A previous unexplained fetal death	2 (1.5%)	0 (0%)	0.498
A previous fetal macrosomia	2 (1.5%)	1 (0.8%)	1.000
A previous malformed baby	0 (0%)	0 (0%)	
History of previous GDM	3 (2.3%)	2 (1.5%)	1.000
History of HT or gestational HT	1 (0.8%)	0 (0%)	1.000
Obesity	15 (11.5%)	11 (8.7%)	0.444
Number of risks			
1 risk	94 (72.3%)	111 (85.4%)	0.01
≥ 2 risks	36 (27.7%)	19 (14.6%)	

Table 3. Comparison of maternal outcomes

	Study group n = 130	Control group n = 130	p-value
GA at delivery (weeks)	38.62 ± 1.25	38.66 ± 1.22	0.788
Preeclampsia	13 (10%)	6 (4.6%)	0.09
Postpartum hemorrhage	0	0	-
Caesarean section	54 (41.5%)	45 (34.6%)	0.25

Table 4. Comparison of neonatal outcomes

	Study group n = 130	Control group n = 130	p-value
Birth weight (gram)	3094.69 ± 367.45	3086.38 ± 387.55	0.859
LGA	11 (8.5%)	14 (10.8%)	0.528
AGA	119 (91.5%)	116 (89.2%)	0.528
SGA	0	0	
5 min Apgar score < 7	0	0	
Neonatal jaundice	40 (30.8%)	43 (33.1%)	0.690

drate intolerance, which was reflected by high GTT level, was related to the higher incidence of caesarean section, pre-eclampsia, fetal macrosomia, and hospital length of stay[4]. A similar study had also found a graded increase in the frequency of shoulder dystocia and other maternal-fetal complication with increasing glucose level during an oral GTT[8]. Results of these studies showed that even non-GDM pregnant women could also have fetal macrosomia and maternal-fetal complication if they developed carbohydrate intolerance during pregnancy.

In addition, some other studies also reported that non-GDM pregnant women, who had abnormal GCT regardless of the oral GTT level, also had a higher incidence of LGA newborn[6,9,10]. The incidence of LGA newborn was greater if abnormal GCT was found during both 16-20 week and 26-30 weeks screening period than among those with abnormal GCT level only during 26-30 weeks[6]. These results demonstrated that minor abnormalities of glucose metabolism without GDM are a significant risk factor for fetal overgrowth. However, in the present study, no difference in the incidence of LGA newborn was observed between non-GDM women who had abnormal and normal GCT.

The present findings were not consistent with the previous studies[6,9,10] that showed the increased rate of LGA newborns, maternal, and neonatal complications in relation to increased glucose intolerance. This inconsistency could be explained partly from practices at the study hospital. In Siriraj Hospital, pregnant women, who are at risk for GDM or demonstrate abnormal GCT, will be counseled to restrict their dietary consumption to control blood sugar level and further prevent the development of GDM late in their pregnancies. In addition, many of these women are already aware of the risks and restricts their dietary consumption themselves. As in the previous study, dietary control in the abnormal GCT group could lead to a decrease in the incidence of fetal macrosomia and caesarean section rate as well[11]. Maternal obesity was considered a risk factor of fetal macrosomia in previous studies[12]. Maternal obesity was found in only a small number of each group without significant differences between the two groups. Therefore, no correlation was observed in the present study.

Various limitations of the present study should be noted. The present study had a smaller sample size when compared to the previous ones and they might not be able to detect such small effects. Moreover, the authors could not control and measure the dietary control counseling among abnormal GCT pregnant women that might have an impact on the pregnancy outcome and might interfere with the results of the present study. A further study is needed to verify the effect of dietary control counseling among women who are at risk for GDM.

In conclusion, non-GDM women with abnormal GCT did not demonstrate any difference in pregnancy and neonatal outcomes. Further study is still needed to examine this relationship between minimal glucose intolerance and adverse pregnancy outcomes in the future.

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อุบัติการณ์การคลอดทารกน้ำหนักมากกว่าอายุครรภ์ระหว่างสตรีที่มีผลการตรวจคัดกรองภาวะเบาหวานระหว่างตั้งครรภ์ปกติและผิดปกติ

จิรพร เหลืองเมตตากุล, ดิฐกานต์ บริบูรณ์หิรัญสาร, อนุวัฒน์ สุตัณฑวิบูลย์, ประเสริฐ ศันสนียวิทยกุล

วัตถุประสงค์*: เพื่อเปรียบเทียบอุบัติการณ์การคลอดทารกน้ำหนักมากกว่าอายุครรภ์ระหว่างสตรีที่มีผลการตรวจคัดกรองภาวะเบาหวานระหว่างตั้งครรภ์ปกติและผิดปกติ*

วัสดุและวิธีการ*: สตรีตั้งครรภ์ที่มีปัจจัยเสี่ยงของภาวะเบาหวานขณะตั้งครรภ์จำนวน 260 คน ที่ได้รับการตรวจคัดกรองตามแนวทางการดูแลรักษาทำการแบ่งสตรีตั้งครรภ์เป็นสองกลุ่ม กลุ่มศึกษาคือสตรีตั้งครรภ์ที่มีผลการตรวจคัดกรองภาวะเบาหวานระหว่างตั้งครรภ์ผิดปกติแต่ไม่ได้รับการวินิจฉัยภาวะเบาหวานขณะตั้งครรภ์จำนวน 130 คน กลุ่มควบคุมคือสตรีตั้งครรภ์ที่มีผลการตรวจคัดกรองปกติจำนวน130 คน ทำการเก็บข้อมูลของทั้งสองกลุ่มเพื่อเปรียบเทียบข้อมูลของมารดาและทารก ระหว่างสตรีสองกลุ่ม*

ผลการศึกษา*: ทั้งสองกลุ่มมีข้อมูลพื้นฐานที่ไม่แตกต่างกันในแง่อายุ, อายุครรภ์ขณะมาฝากครรภ์ครั้งแรก, น้ำหนัก, ปัจจัยเสี่ยงต่อการเกิดภาวะเบาหวานขณะตั้งครรภ์ ยกเว้นจำนวนบุตรที่คลอดมีชีวิตและจำนวนปัจจัยเสี่ยงต่อการเกิดภาวะเบาหวานในสตรีตั้งครรภ์ในกลุ่มศึกษามากกว่ากลุ่มควบคุมอย่างมีนัยสำคัญทางสถิติ อุบัติการณ์การคลอดทารกน้ำหนักมากกว่าอายุครรภ์ของกลุ่มศึกษาและกลุ่มควบคุมไม่มีความแตกต่างกันทางสถิติ (8.5% และ 10.8% ตามลำดับ p = 0.528) นอกจากนั้นยังพบว่าอายุครรภ์ขณะคลอด การเกิดภาวะความดันโลหิตสูงระหว่างตั้งครรภ์ การคลอดก่อนกำหนด ภาวะตัวเหลืองของทารกหลังคลอดไม่แตกต่างกันระหว่างทั้ง 2 กลุ่ม ในการศึกษานี้ไม่มีมารดาตกเลือดหลังคลอดและไม่มีภาวะทารกขาดออกซิเจนเกิดขึ้น*

สรุป*: ไม่พบความแตกต่างกันทางสถิติของอุบัติการณ์การคลอดทารกน้ำหนักมากกว่าอายุครรภ์ระหว่างสตรีที่มีผลการตรวจคัดกรองภาวะเบาหวานระหว่างตั้งครรภ์ปกติและผิดปกติในโรงพยาบาลศิริราช*