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Original Research Article

A single abnormal value of 100 g oral glucose tolerance test and pregnancy outcomes

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ABSTRACT

Background: In the worldwide, diabetes mellitus is one of the most common medical complications in pregnancy, the prevalence is about 5% and seems to increase. Objective of this study was to evaluate the effect of a single abnormal value of 100 g OGTT on pregnancy outcomes.
Methods: This retrospective cohort study was conducted from January 2014 to December 2018 to identified 600 singleton pregnancies who tested for gestational diabetes by 100g OGTT. They divided into 2 groups equally. Pregnancy outcomes of women who had a single abnormal value were compared with women who had a negative test. Pregnancies with prior cesarean delivery were excluded.
Results: Between two groups, the baseline characteristic of the patients were comparable except maternal age [33 (26.37) versus 30 (24.36), p = 0.001] was statistically higher in the study group. Even though the most of adverse pregnancy outcome tend to be higher in study group, but not reach the significance, the rate of cesarean delivery (35.7% versus 25.7, RR 1.39, 95% CI 1.08-1.78), postpartum hemorrhage (38.6% versus 30%, RR 1.29, 95% CI 1.03-1.62) and NICU admission (5.6% versus 1.0%, RR 5.69, 95% CI 1.80-17.96) were higher in study group with significant difference. Caesarean delivery (38.8% versus 28.7%, p = 0.04) and NICU admission (9.5% versus 1.9%, p = 0.0003) were more common if the blood glucose greater than 10 mg/dl normal level.
Conclusions: A single abnormal value of 100 g OGTT had significant impact on pregnancy outcome such as increase cesarean section, postpartum hemorrhage and NICU admission.

Keywords: 100g oral glucose tolerance test, Gestational diabetes mellitus, Pregnancy, outcome Single abnormal value

INTRODUCTION

In the worldwide, diabetes mellitus is one of the most common medical complications in pregnancy, the prevalence is about 5% and seems to increase.[1,2] In Thailand, diabetes mellitus during pregnancy is about 2-9%.[3,4] According to study population, the lower northern part of Thailand, diabetes during pregnancy is still the most common medical problem in pregnant women, which prevalence is about 7.5% and the majority of this problem is gestational diabetes mellitus.[5]

Gestational diabetes mellitus (GDM) is the carbohydrate intolerance from insulin resistance that first recognized during pregnancy that has an impact on adverse pregnancy outcomes such as increase rate of preeclampsia, preterm labor and delivery, postpartum hemorrhage and caesarean delivery. Even more, the new-born is at increased risk of macrosomia, polycythaemia, jaundice, shoulder dystocia and birth trauma.[1,6]

Screening and diagnostic protocol for GDM are varied depends on hospital policy. In the hospital, screening for

GDM was the risk-based screening protocol. Screening test was 1 hour 50 GCT and cut off level was 140 mg/dl. If the pregnancies had an abnormal screening test, they had undergone diagnostic test in the next couple weeks. GDM was defined if patients had 2 or more abnormal values of 100 g OGTT based on Carpenter and Coustan criteria.

Clinical risk factors for GDM screening are included maternal obesity (pre-pregnancy BMI ≥ 30 kg/m^2), first degree related DM, advanced maternal age (≥ 35 years old at EDD.), prior macrosomia, prior unexplained stillbirth, sudden weight gain, persistent glucosuria or underlying medical condition such as chronic hypertension, SLE or chronic kidney disease.

There is undisguised that GDM associated with various maternal, fetal and neonatal outcomes, but there are obscure in pregnancy outcomes in pregnant women who had only an abnormal value of 100 g OGTT.[7-9] Because abnormal value of 100 g OGTT shows some degree of carbohydrate intolerance that might be increased risk of pregnancy outcomes.

Therefore, this study was conducted to evaluate the pregnancy outcomes between pregnancies who had a single abnormal valve and normal OGTT.

METHODS

A retrospective cohort study was conducted at Obstetrics and Gynecology unit, Buddhachinaraj Phitsanulok hospital after ethical approved by the institutional review boards. Medical database between January 2014 to December 2018 was assessed.

Inclusion criteria

- Singleton pregnancy who attended at ANC clinic and delivery at our hospital
- No history of pregestational DM
- Performed diagnostic test for GDM and had single abnormal value.
- The control group was the pregnant women who had the same criteria for the study group but had a normal 100 g OGTT.

Exclusion criteria

- Pregnant women who had a prior cesarean delivery
- Incomplete medical records.

The maternal clinical risk factors for GDM were evaluated as maternal baseline characteristics. Obstetric outcomes such as preeclampsia, gestational hypertension, eclampsia, preterm delivery, route of delivery, macrosomia, postpartum hemorrhage, shoulder dystocia, Apgar score at 5 minutes and NICU admission were reviewed.

The data were analyzed using open-accessed R software. The sample size was calculated based on a power analysis, using the rate of cesarean delivery in single abnormal value of 100 g OGTT was 24.9% and 15.4% in normal test from previous study to gain power of 80% at 95% confidence interval, the study needed sample size at least 279 cases for each group.[8]

Descriptive data were presented as number (percentage) or median and interquartile length due to abnormal distribution of data. Outcomes were compared between the study group and control group using Chi-square test or Fisher's exact test, relative risk and 95% confidence interval as appropriate. A p value <0.05 was considered statistically significant.

The primary outcome was the cesarean delivery rate. The secondary outcomes were as follows: gestational hypertension, preeclampsia, eclampsia, preterm delivery, postpartum hemorrhage, macrosomia, Apgar score less than 7 at 5 minutes and NICU admission.

RESULTS

During the period studied, 300 pregnancies who had single abnormal value of 100 g OGTT was enrolled and grouped as the study, whereas 300 pregnant women with normal OGTT test grouped as the control. Mean age of the study group was significantly higher than control group [33 (26.37) and 30 (24.36), p = 0.001]. Most pregnancies were multiparous, 62.7% in both groups and p = 1.0. Most of clinical risk factors were comparable between both groups as shown in Table 1.

Table 1: Maternal demographic characteristics.

Characteristic	Control group	Study group	p value
Maternal age (year)[1]	30 (24.36)	33 (26.37)	0.001
Parity	-	-	1.00
Nulliparous	112 (37.3%)	112 (37.3%)	-
Multiparous	188 (62.7%)	188 (62.7%)	-
Pre-pregnancy BMI (kg/m^2)[1]	24.5 (20.9, 29.2)	24.9 (21.5, 28.2)	00.83
Chronic hypertension	35 (11.7%)	23 (8%)	00.125
First degree relative of diabetes mellitus	77 (25.6%)	7(23.7%)	0.652
Prior GDM in pregnancy	1 (0.3%)	1 (0.3%)	1.0
Prior stillbirth	2 (0.7%)	2 (0.7%)	1.0
Prior macrosomia	2 (0.7%)	1 (0.3%)	0.09
Sudden weight gain	27 (9%)	33 (11%)	0.48

Caesarean delivery and PPH were higher in the study group with statistical significance (35.7% versus 25.7%,

p = 0.008 and 38.6% versus 30.0%, p = 0.025 for the study and control group, respectively), as presented in Table 2. The following were the rate of pregnancy outcomes that similar in both groups: preeclampsia, gestational hypertension, eclampsia, preterm birth and Apgar score less than 7 at 5 minutes. The rate of macrosomia was trended to be higher in the study group, but not reach a statistical level. In neonatal outcome, the rate of NICU admission was significantly higher in the study group 5.6% versus 1.0%, p = 0.001 (relative risk 5.69; 95% CI: 1.80-17.96).

Table 2: Adverse perinatal outcomes in pregnant women with normal 100 g OGTT compared with single abnormal value of 100 g OGTT.

Adverse perinatal outcomes	Control group number (%)	Study group number (%)	p value	Adjusted relative risk	95% CI interval
Preeclampsia	17(5.6%)	18 (6.0%)	0.864	1.06	0.50-2.25
Gestational hypertension	3 (1%)	8 (2.6%)	0.142	2.6	0.64-16.06
Eclampsia	5 (1.6%)	6 (2.0%)	0.772	1.2	0.30-5.06
Preterm birth (GA <37 weeks)	34 (11.3%)	43 (14.3%)	0.275	1.27	0.79-2.04
Caesarean delivery	77 (25.7%)	107 (35.67%)	0.008	1.39	1.08-1.78
PPH	90 (30%)	116 (38.6%)	0.025	1.29	1.03-1.62
Macrosomia	6 (2%)	13 (4.3%)	0.109	2.17	0.74-6.39
Apgar score <7 at 5 minutes	1 (0.3%)	2 (0.7%)	0.812	2.01	0.00-1.99
NICU admission	3 (1.0%)	17 (5.6%)	0.001	5.69	1.80-17.96

Table 3: Adjusted relative risk for adverse outcomes compare between value of abnormal level.

Adverse perinatal outcomes	Range of Abnormal Value		p value	Relative risk (95% CI)
	≤10 mg/dL number (%) (485)	>10 mg/dL number (%) (115)		
Preeclampsia	25 (5.2%)	10 (8.6%)	1.82	1.73 (0.72-3.87)
Gestational hypertension	9 (1.9%)	2 (1.7%)	1.0	0.93 (0.09-4.57)
Eclampsia	9 (1.9%)	2 (1.7%)	1.0	0.93 (0.09-4.57)
Preterm birth	63 (13%)	14 (12.1%)	0.87	0.92 (0.45-1.74)
Caesarean delivery	139 (28.7%)	45 (38.8%)	0.04	1.57 (1.01-2.45)
PPH	160 (33%)	46 (39.7%)	0.19	1.33 (0.85-2.06)
Macrosomia	14 (2.9%)	5 (4.3%)	0.38	1.51 (0.42-4.56)
Apgar score <7 at 5 minutes	2 (0.4%)	1 (0.9%)	0.47	2.09 (0.04-40.5)
NICU admission	9 (1.9%)	11 (9.5%)	0.0003	5.51 (2.02-15.48)

Table 3 was demonstrated the effect of blood glucose to pregnancy outcomes. When divided study group into 2 groups based on blood glucose, group 1 was blood glucose level greater normal limit not above 10 mg/dL. and the group 2 was blood glucose level greater normal limit above 10 mg/dL. Caesarean delivery (38.8% versus 28.7%, p = 0.04; RR 1.73, 95% CI 1.01-2.45) and NICU admission (9.5% versus 1.9%, p = 0.003; RR 5.51, 95% CI 2.02-15.48) was significantly higher when blood glucose greater than normal limit above 10 mg/dL. The other pregnancy outcomes were comparable.

DISCUSSION

Baseline characteristics as clinical risk factors for gestational diabetes were comparable unless maternal age in the study group was significantly higher that similar to earlier studies.[8-10] Since insulin resistance increase with age might be the reason for this finding.

This result of this study revealed that the rate of cesarean delivery was increased significantly, that might be the reason for significantly increase risk of PPH in the study group as well. Nevertheless, the rate of the NICU was also significantly higher. These adverse outcomes were similar to pregnancy with GDM especially when the blood glucose level was above normal level exceed 10 mg/dL.[1,6] The rate of macrosomia was trended to be higher in the study group, but not reach a statistical level. These findings might reflect some degree of glucose intolerance in this pregnancy but the management was still the same as a normal test.

In earlier, the multicenter treatment trial of 958 women with mild GDM found that shown that treatment of GDM by dietary intervention, self-monitoring of blood glucose, or insulin therapy reduced risk of cesarean delivery rate.[11] Recently, ACOG Practice Bulletins in February 2018 recommended in all pregnancy women with GDM should receive nutritional and exercise counseling.[6] This

subgroup of patient, single abnormal value of 100 g OGTT, might be benefit if they received nutritional and exercise counseling program and prospective randomized controlled studies are needed to confirm this suggestion.

The strength of this study consists of high homogeneity of the patients and the normal controls were received all screening and diagnostic of GDM as the study group. The weakness of this study was retrospective study that may have been affected by collection accuracy.

CONCLUSION

This study shows strong evidence that a single abnormal value of 100 g OGTT increase caesarean delivery rate, PPH and NICU admission.

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