Prevalence of Gestational Diabetes Mellitus (GDM) in Pregnant Women Aged 30 to 34 Years Old at Phramongkutklao Hospital

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Objective: *To assess the prevalence of GDM in pregnant women aged 30 to 34 years old who were screened by glucose challenge test (GCT) at Phramongkutklao Hospital*
Material and Method: *The cross-sectional data were collected from 1332 pregnant women aged between 30-34 years who attended the antenatal care clinic and delivered at Phramongkutklao Hospital from March, 2003 to January, 2005. The 564 pregnant women aged between 30-34 years old who joined the project were tested by GCT at the gestational age of 24-28 weeks. If the level of blood sugar was the abnormal results, 100-g, 3-hour oral glucose tolerance test (OGTT) would be conducted. All relevant data including demographic information, risks factor for GDM, GCT and OGTT results and pregnancy outcomes were collected for further statistical analysis.*
Results: *There were 1332 pregnancies enrolled into the study. The 564 pregnant women were eligible for GCT with 228 positive results. Thirty-two cases of GDM were detected with the prevalence of 5.7%. In the GDM group, percentage of the common risk factors were family DM (28.1%) glucosuria (12.5%). Furthermore, only one case of premature rupture of membrane and one case of pregnancy-induced hypertension were found. Preterm labor, LGA, SGA, birth asphyxia, fetal anomalies and cesarean section were observe in 3.1%,9.4%,0%, 0%, 0%, and 40.6% respectively*
Conclusion: *The prevalence rate of GDM in pregnant women aged 30-34 years old screened by GCT at Phramongkutklao Hospital is 5.7%. The GDM class A_1 were 23 cases (4.1%) and GDM class A_2 were nine cases (1.6%). Their impact on obstetric complication and pregnancy outcome was inconclusive due to the small number of cases.*

Keywords: *GDM, Age, Prevalence of GDM, GCT, OGTT*

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Gestational diabetes mellitus (GDM) is a state of carbohydrate intolerance that develops or is first recognized during pregnancy[1-4]. It imposes many risks on both the mother and the child, and the prognosis becomes even worse during pregnancy. The prevalence of gestational diabetes is between 2-5 percent of the total pregnant population[1,2], and is increasing in a group of elderly gravidas. In Phramongkutklao Hospital, there are about 2.2[5]. Pregnant women with recognizable risk factors should be screened for gestational diabetes. The early diagnosis for gestational diabetes can prevent and reduce risks in a mother and her child[6-8]. At the Department of Obstetrics and Gynecology, Phramongkutklao Hospital, all women with risk factors for gestational diabetes are screened, these include the following factors,

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- Maternal age ≥ 35 years
- Family history of DM
- Previous child > 4000 grams, history of fetal anomaly or death fetus in utero
- Hypertension
- Positive urine sugar
- History of GDM in previous gestation
- Obvious obesity (body mass index > 30 kg/m^2)

If the screening is limited to the pregnant women at risk, the diagnosed cases may be lower than actual. In some elderly women with no risks as mentioned above, might have gestational diabetes. The American College of Obstetricians and Gynecologists (ACOG) recommends the screening for gestational diabetes be conducted in women at the age of 30 years and over[1]. This study focused on prevalence of gestational diabetes in pregnant women aged 30 to 34 years old. If the prevalence of the disease is high, the indication of this screening concerning the women's age may be adjusted.

Material and Method

The cross-sectional study data were collected from 1,332 pregnant women aged between 30-34 years who received antenatal care (ANC) at Phramongkutklao Hospital from March 2003 to January 2005. Inclusion criteria were**:** First, the actual gestational age were identified. Second, those cases were willing to participate in the project after obtaining information and signing inform consent before enrolled to the project. Pregnant women who did not sign inform consent were followed for pregnancy complications and outcomes. An exclusion criterion was the pregnant women with the history of diabetes mellitus. The participants were interviewed with standardized questionnaire to obtain risk factors for GDM including the first degree relative's history of diabetes, large fetus (> 4000 grams), congenital deformity of fetus, unknown cause of intrauterine fetal death, hypertension, previous GDM and obvious obesity (BMI > 30 kg/m^2)

The participants were enrolled according to inclusion and exclusion criteria. 564 pregnant women were tested 1-hour glucose challenge test (GCT) at 24-28 weeks. A 50-g of glucose was given orally. If blood sugar was more than 140 mg/dl after 1 hour, the results were positive. In patient with positive GCT, OGTT with 100-g glucose ingestion was performed for GDM diagnosis using the plasma glucose cut off values of 105, 190, 165, and 145 mg/dl at the fasting period, 1, 2 and 3 hour, respectively[4]. If two or more plasma glucose values were equal or greater than the normal criteria, GDM was diagnosed. In cases of fasting glucose value being normal value, the patients would be defined as GDM class A_1 while GDM class A_2 was classified as fasting glucose value being 105 mg/dl or greater.

Obstetric complications such as gestational hypertension, pregnancy induced hypertension (PIH), premature rupture of membranes (PROM) were observed in the present study. Pregnancy outcomes including preterm labor, route of delivery and birth weight were also described. Small-for-gestational-age (SGA) was defined as birth weight below the 10^{th} percentile of expected weight for gestational age while large-for-gestational-age (LGA) was defined as birth weight greater than the 90^{th} percentile of expected weight for gestational age according to Thai population's birth weight distribution curve[9]

Primary outcome measure was the prevalence of GDM in pregnant women aged 30 to 34 years old. Pregnancy complications and outcomes of pregnant women who signed inform consent (screening for GDM) and did not sign inform consent (non-screening GDM) were also evaluated. The results were analyzed using SPSS version 10. The participants with abnormal values of OGTT were calculated in percentage. The results were considered statistically significant at $p < 0.05$ with 95% of confidence interval (CI). This study has been approved by the ethical review committee of the Royal Thai Army Medical Department.

Results

During the study period, there were totally 1,332 pregnancies aged 30-34 years who attended the ANC clinic at Phramongkutklao Hospital. According to the inclusion criteria, there were 564 pregnant women eligible for GCT screening at Fig. 1. Mean maternal age and gestational age were 31.7 years old and 26.8 weeks, respectively (Table 1). However, 143 pregnant women with age 30-34 years old and no other risk factor were positive GCT and 259 pregnant women in the same group were negative GCT. In the group with risk factors, 85 cases of positive GCT and 77 cases of GCT

Table 1. Demographic data

Characteristics	Mean ± SD*
Age (yr)	31.7 ± 1.3
First ANC (wk.)	13.0 ± 5.3
Gestation age (wk.)	26.8 ± 1.2

* SD = standard deviation

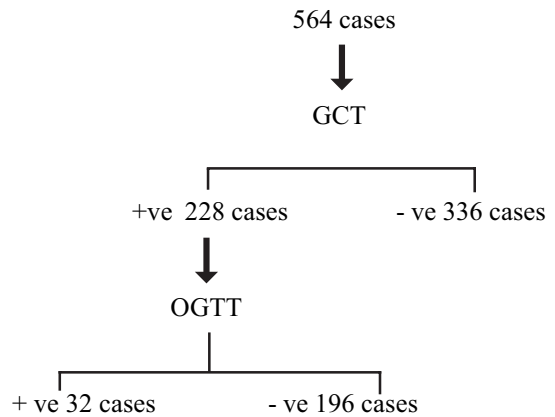

Fig. 1 Flow chart

negative were found. The prevalence rate ratio (PRR) of the participants who had risk factor(s) compared with the participants who had no risk factor indicated higher chance to be positive GCT 1.4 times with statistically significant in Table 2. Table 3 describes pregnant women aged 30-34 years old with no risk factor. Eighteen cases were not diagnosed due to the old criteria for GDM screening of Phramongkutklao hospital. In the group with one or more risk factors, 14 cases of positive OGTT were found. Eightyfive cases were at risk for disease. In this group, 79 cases had only one risk factor and the rest of them or six cases had two risk factors. However, it was found that 32 cases had GDM based on positive OGTT. The prevalence of GDM was 5.7%. Table 4 describes eighteen 30-34 years old pregnant women with no other risk factor than GDM. In this group, they were divided as 14 cases for GDM class A_1 and 4 cases for GDM class A_2. In the group with risk factor, 14 cases were classified into GDM class A_1 for nine cases and GDM class A_2 for five cases. PRR compared between with risk factor(s) and without risk factor had higher chance of 1.6 times to be GDM class A_1 and 3.1 times to be GDM class A_2, respectively but not statistically significant.

Table 2. Prevalence of GCT +ve by risk factors exposure

Risk Factors*	GCT +ve	GCT -ve	PRR (95%CI)
Risk factor(s) +ve	85	77	1.4 (1.2,1.8)
Risk factor -ve	143	259	
Total	228	336	

* Risk factor = Family DM, large fetus, hypertension, urine sugar +ve, history of GDM, obesity

Table 3. Prevalence of GDM by number of risk factors and in patients with +ve GCT

Risk factors*	OGTT +ve	OGTT -ve
Risk factors +ve	14	71
None	18	125
1 risk factor	13	66
2 risk factors	1	5
Total	32	196

* Risk factors = Family DM, large fetus, hypertension, urine sugar +ve, history of GDM, obesity

Table 4. Prevalence of GDM by type of GDM by risk factors exposure

Risk factors*	GDM A_1	PRR (95%CI)	GDM A_2	PRR (95%CI)
Risk factors +ve	9	1.63	5	3.17
None	14	(0.7, 3.7)	4	(0.9, 11.6)
Total	23		9	

* Risk factors = Family DM, large fetus, hypertension, urine sugar +ve, history of GDM, obesity

Table 5 presents percentage of GDM by type of risk factors. It shows that the most common risk factor is family history of DM (28.1%), followed by glucosuria (12.5%), hypertension (3.1%) and history of GDM (3.1%), respectively. Premature rupture of the membranes (PROM) was apparently the most common obstetric complication (5.1%) particularly in observed in the non- screening group (5.9%) and the non GDM group (3.6%). PIH was the second most common complication found (2.1%) in table 6. Vaginal delivery was the most common route of birth (64.8%) followed by cesarean section (35.2%). Preterm labor, LGA, SGA,

Table 5. Percentage of GDM patient by type of risk factors

Risk factors*	GDM (n =32)	(%)
None	18	(56.2)
Family DM	9	(28.1)
Large fetus	0	(0)
Hypertension	1	(3.1)
Urine sugar + ve	4	(12.5)
History of GDM	1	(3.1)
Obese women	0	(0)

(* one case had 2 risk factors)

Table 6. Obstetric complications in the studied population (n = 1,332)

Complications	Non-screening group** n = 862 (%)	Screening group*** n = 470*		Total n = 1332 (%)
		Non GDM n = 438 (%)	GDM n = 32 (%)	
PROM	51 (5.9)	16 (3.6)	1 (3.1)	68 (5.1)
PIH	21 (2.4)	7 (1.5)	1 (3.1)	29 (2.1)
Gestational HT	3 (0.3)	0	0	3 (0.2)
Chronic HT	4 (0.4)	2 (0.4)	0	6 (0.5)
Twin	5 (0.5)	3 (0.6)	0	8 (0.6)
PPH	3 (0.3)	2 (0.4)	0	5 (0.4)
Chorioamnionitis	1 (0.1)	3 (0.6)	0	4 (0.3)
Polyhydramnios	0	1 (0.2)	0	1 (0.1)
Total	88	34	2	122

* Ninety four cases lossed follow up, ** Non-screening group = Patients didn't sign consent form
*** Screening group = Patients signed consent form

Table 7. Pregnancy outcomes in the studied population (n = 1,332)

Pregnancy outcomes	Non-screening group*** n = 862 (%)	Screening group**** n = 470**		Total n = 1332 (%)	p-value*
		Non GDM n = 438 (%)	GDM n = 32 (%)		
Preterm delivery	37 (4.4)	15 (3.4)	1 (3.1)	53 (4.0)	0.543
Birth weight [9]					
> 90 percentile	72 (8.3)	40 (9.1)	3 (9.4)	115 (8.6)	0.831
< 10 percentile	32 (3.7)	20 (4.6)	0	52 (3.9)	0.531
Apgar score (< 7 at 5 min)	5 (0.5)	4 (0.9)	0	9 (0.7)	<0.001*
Fetal anomalies	5 (0.5)	2 (0.4)	0	7 (0.5)	<0.001*
Route of delivery					
- Vaginal route	554 (64.3)	290 (66.2)	19 (59.4)	863 (64.8)	0.8418
- Cesarean Section	308 (35.7)	148 (33.8)	13 (40.6)	469 (35.2)	

* p-value < 0.05 = statistical significant (chi-square), ** Ninety-four cases lossed follow up
*** Non-screening group = Patients didn't sign consent form, **** Screening group = Patients signed consent form

birth asphyxia and fetal anomalies were observed in 4%, 8.6%, 3.9%, 0.7% and 0.5% respectively. There was no statistical significance in pregnancy outcomes of preterm birth, LGA, SGA, and cesarean section rate between screening and non screening group. However, birth asphyxia and fetal anomalies were significantly different between screening and non screening group (Table 7).

Discussion

From the study in pregnant women aged 30-34 years, it revealed that the prevalence of gestational diabetes mellitus (GDM) was 32 cases (5.7%) which were divided into GDM class $A_1$23 cases (4.1%) and GDM class A_2 9 cases (1.6%) or when comparing to Coustan DR et.al.'s finding of 3.0% prevalence in the same age group[10]. Also from Coustan DR.et.al.'s study, all patients undergo a 3- hour OGTT after a GCT (two-step approach) indicate that the 140mg/dl threshold results in 80%- 90% sensitivity. Thus one fifth of patients with GDM of this study may not be diagnosed. According to the clinical guideline for pregnant patients in Phramongkutklao Hospital, the screening test for diabetes mellitus is provided to pregnant women aged 35 years old or over, or have the risk factors such as history of diabetes mellitus in the family, the history of large fetus (birth weight more than 4000 grams), congenital anomalies, unexplained fetal death, hypertension, sugar in the urine, history of previous gestational diabetes, and obeseity (body mass index > 30 kg/m^2). In this study, the results showed that pregnant women with an age of 30-34 years old with no other risk factors as mentioned above were not screened for diabetes mellitus. Eighteen cases could not be diagnosed for GDM. Fourteen cases were GDM class A_1 and 4 cases were GDM class A_2. If the patients with GDM were treated unsuitably, it was significantly related to the high incidence of morbidity and mortality[11]. The appropriate treatment for GDM will reduce the unexpected results and complications that could occur to the mother and the child. These include unexplained fetal death, preterm delivery, premature labor, hydramnios, macrosomia and maternal metabolic complications[1-4]. Concerning GDM group, PROM and PIH were the only obstetric complication observed while pregnancy outcomes were comparable to the other. However, the impact of GDM on obstetric complications and pregnancy outcome was inconclusive due to the small number of studied population. In the future, large scale research should be conducted in a prospective manner to clarify the statistical difference in pregnancy complication and outcome.

From some experts' advice for DM screening in all cases needs to be considered and weighed between the cost and the prevention of morbidity and mortality in mother and child. Some study showed that if the screening test was conducted in pregnant women with the age of 25 years and over, GDM cases would be in-creased 33.6%[10] compared to the age of 30 years or over.

In conclusion, many researches revealed that age of pregnant women was highly significant to the risk of GDM but no consensus on the threshold was concluded. The American College of Obstetricians and Gynecologists recommended that pregnant women over the age of 30 be screened for GDM[1]. When the pregnant woman is below 30, then the test would be conducted only when having clinical or historical factors. The prevalence of gestational diabetes mellitus (GDM) in pregnant women aged 30 to 34 years old who were screened by GCT was 5.7%. Its impact on obstetrics complications and pregnancy outcome was inconclusive due to the small number of studied population.

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References

1. American College of Obstetricians and Gynecologists. Clinical management guidelines for obstetricians-gynecologists. ACOG Practice Bulletin no: 30. Washington, DC: ACOG; 2001.
2. Report of the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus. Diabetes Care 2000; 23(Suppl 1): S4-19.
3. Feudtner C, Gabbe SG. Diabetes and pregnancy: four motifs of modern medical history. Clin Obstet Gynecol 2000; 43: 4-16.
4. Cunningham FG, MacDonald PC, Gant NF, Leveno KS, Gilstrap LC III, Hankins GD, et al. Diabetes. Williams obstetrics. 20th ed. New York: McGraw Hill; 2001.
5. Medical record of OB-GYN Department at Phramongkutklao Hospital. Bangkok: Phramongkutklao Hospital; 2001.
6. O'Sullivan JB, Charles D, Mahan CM, Dandrow RV. Gestational diabetes and perinatal mortality rate. Am J Obstet Gynecol 1973; 116: 901-4.
7. Moore TR. Diabetes in pregnancy. In: Creasy RK, Resnik R, editors. Maternal fetal medicine: principles and practice. 4th ed. Philadelphia: WB

Saunders; 1999: 964-95.
8. Serirat S, Deerochanawong C, Sunthornthepvarakul T, Jinayon P. Gestational diabetes mellitus. J Med Assoc Thai 1992; 75: 315-9.
9. Thaithamyanon P, Bhongvej S, Chittinond S. Intrauterine growth in a Thai population. J Pediatr Soc Thai 1984; 23: 99-106.
10. Coustan DR, Nelson C, Carpenter MW, Carr SR, Rotondo L, Widness JA. Maternal age and screening for gestational diabetes: a population-based study. Obstet Gynecol 1989; 73: 557-61.
11. Brody SC, Harris R, Lohr K. Screening for gestational diabetes: a summary of the evidence for the U.S. Preventive Services Task Force. Obstet Gynecol 2003; 101: 380-92.

ความชุกโรคเบาหวานขณะตั้งครรภ์ในสตรีอายุ 30-34 ปี ที่โรงพยาบาลพระมงกุฎเกล้า

เพิ่มศักดิ์ สุเมฆศรี, สายจิตต์ วงศ์ใหญ่, พจน์ เอมพันธุ์

วัตถุประสงค์: *ประเมินความชุกโรคเบาหวานขณะตั้งครรภ์ในสตรีอายุ 30-34 ปี ที่ถูกตรวจคัดกรองด้วยวิธี glucose challenge test ในโรงพยาบาลพระมงกุฎเกล้า*

วัสดุและวิธีการ: *เป็นการศึกษาวิจัยแบบภาคตัดขวางโดยเก็บจากข้อมูลสตรีตั้งครรภ์ 1,332 ราย อายุ 30-34 ปีที่มาฝากครรภ์และคลอด ณ โรงพยาบาลพระมงกุฎเกล้า ช่วงระหว่างเดือนมีนาคม พ.ศ. 2546 ถึง มกราคม พ.ศ. 2548 คัดเลือกสตรีตั้งครรภ์ 564 ราย ตามเกณฑ์ที่กำหนด สตรีตั้งครรภ์อายุ 30-34 ปี ที่เข้าร่วมโครงการวิจัย จะได้รับการตรวจ 50-g, 1-hour glucose challenge test (GCT) ขณะอายุครรภ์ 24-28 สัปดาห์ ถ้าพบว่าผิดปกติจะได้รับการตรวจ 100-g, 3-hour oral glucose tolerance test (OGTT) ต่อไป และทำการเก็บข้อมูลพื้นฐานของแต่ละคน ได้แก่ ข้อมูลทางด้านประชากรศาสตร์, สูติศาสตร์ทั่วไป, ปัจจัยเสี่ยงต่อการเป็นเบาหวาน, ผลการตรวจ GCT และ OGTT ตลอดจนผลลัพธ์ของการตั้งครรภ์และนำข้อมูลที่ได้มาวิเคราะห์ทางสถิติต่อไป*

ผลการศึกษา: *จากกลุ่มตัวอย่างศึกษาทั้งหมด 1,332 ราย ได้รับการตรวจคัดกรองโรคเบาหวานขณะตั้งครรภ์ 564 ราย ผล GCT ผิดปกติ 228 ราย ตรวจพบเป็นโรคเบาหวานขณะตั้งครรภ์ร้อยละ 5.7 พบว่าในกลุ่มนี้ ปัจจัยเสี่ยงต่อการเกิดโรคเบาหวานขณะตั้งครรภ์ 2 ลำดับแรกคือ มีเบาหวานในครอบครัวร้อยละ 28.1 มีน้ำตาลในปัสสาวะ ร้อยละ 12.5 พบภาวะแทรกซ้อนจากน้ำเดินก่อนเจ็บครรภ์คลอด 1 ราย ความดันโลหิตสูงในระหว่างการตั้งครรภ์ 1 ราย คลอดก่อนกำหนดร้อยละ 3.1 ทารกตัวโตร้อยละ 9.4 ผ่าตัดคลอดร้อยละ 40.6*

สรุป: *ความชุกของโรคเบาหวานขณะตั้งครรภ์ในสตรีอายุ 30-34 ปี ที่ได้รับการตรวจคัดกรองโรคเบาหวานด้วยวิธี GCT ที่โรงพยาบาลพระมงกุฎเกล้าเท่ากับร้อยละ 5.7 โดยเป็น GDM Class A_1 23 ราย (4.1%) และ GDM Class A_2 9 ราย (1.6%) โดยผลแทรกซ้อนและผลลัพธ์ของการตั้งครรภ์ไม่สามารถสรุปได้เนื่องจากประชากรที่ศึกษาน้อยเกินไป*