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Prevalence of Gestational Diabetes Mellitus Detected by International Association of the Diabetes and Pregnancy Study Groups (IADPSG) Criteria in Phramongkutklao Hospital

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ABSTRACT

Objective: To determine the prevalence of gestational diabetes mellitus (GDM) diagnosed with International Association of the Diabetes and Pregnancy Study Groups (IADPSG) criteria and identify risk factors of GDM in pregnant women who attended antenatal clinic at Phramongkutklao Hospital.

Materials and Methods: This was a descriptive study. Pregnant women who underwent antenatal visit at Phramongkutklao Hospital from December 2013 to September 2014 were enrolled and universal screening for GDM was done. After exclude multi-fetal pregnancy and overt DM, the remaining subjects were reviewed for age, gravida, parity, gestational age at screening, expected date of confinement (EDC), known risk factors of GDM, past and personal histories. A 2-hours 75 gm oral glucose tolerance test (75-gm OGTT) was performed. Outcome was the prevalence of pregnant women with GDM and risk factor for GDM among selected population.

Results: Three hundred and twenty-five pregnant women were included. Mean age was 29.72 years old. One hundred and eight women was in high risk group (33.23%), 193 (59.38%) and 24 (7.39%) women were identified in average and low risk group, respectively. The prevalence of GDM was 21.8%, which is comparable to reported range from previous studies. Risk factors associated with GDM was age ≥ 35 years.

Conclusion: The prevalence of pregnant women with GDM in antenatal clinic at Phramongkutklao Hospital diagnosed with IADPSG criteria was 21.8% and the risk factor for GDM was age ≥ 35 years.

Keywords: gestational diabetes mellitus, IADPSG, 2-hours 75 gm OGTT

Introduction

Gestational diabetes mellitus (GDM) is one of the most common medical problems in pregnancy[1]. Of all the pregnant women complicated with diabetes mellitus (DM), 90 % of which were GDM while the rest were pre-gestational DM that was first recognized during pregnancy[2]. The prevalence of GDM was reported to be 6-7 % various among ethnicity and

prevalence of type 2 DM in each population[1]. Undetected or poor controlled GDM can lead to adverse pregnancy outcomes for both mother and fetus[3-4]. Early diagnosis and appropriate treatment to control blood sugar can help to prevent these adverse consequences[5].

Screening and diagnostic test for GDM had long been interested and evaluated in many studies. O'Sullivan and Mahan[6] (1964) first published a criteria for oral glucose tolerance test (OGTT) in pregnancy which was followed by a screening criteria for high-risk gestational diabetic patients[7]. The National Diabetes Data Group[8] (NDDG), Carpenter and Coustan[9], and the American Diabetes Association[10] (ADA) subsequently recommended different cut-off criteria for diagnosis of GDM which were widely used in many countries. In 2005, the fifth international workshop conference on GDM[11] proposed risk-stratified management in screening of GDM into three groups: low risk - no need for screening, moderate risk - screening at 24-28 weeks of gestation, and high risk - screening at first antenatal visit and repeat at 24-28 weeks of gestation. They also suggested that either one-step approach with 75-gm OGTT or two-step approach with 50-gm glucose challenge test (50-gm GCT) followed by 100-gm OGTT was appropriate in GDM screening[11]. Recently, the International Association of Diabetes and Pregnancy Study Group[12] (IADPSG), based on data from the hyperglycemia and adverse pregnancy outcome research cooperative study group[13] (HAPO study) which focused on pregnancy outcome in pregnant women, found that the criteria for diagnosis of GDM would be more correlated with fetal macrosomia and caesarean delivery rate when thresholds of a 2-hour 75-gm OGTT was set to be ≥ 92, ≥ 180 and ≥ 153 mg/dl for fasting plasma glucose, 1-hr plasma glucose and 2-hr plasma glucose, respectively. GDM was diagnosed when at least one abnormal value was found.

Traditionally at Phramongkutklao Hospital, two-step approach was performed after pregnant women were classified by their risk factors. One-hour 50-gm GCT will be tested first. If the value was ≥ 140 mg/dl, which was defined as abnormal, then a 3-hour 100-gm OGTT will subsequently be performed. Thus, the data regarding prevalence of GDM after diagnosed with one-step approach by 2-hour 75-gm OGTT (IADPSG) in Phramongkutklao Hospital will have never been published before. Also, 2-hr 75-gm OGTT was superior to two-step approach because it requires shorter time to completion, decrease health care cost and increase patient satisfactory. So, the objectives of this study were proposed to determine the prevalence of GDM diagnosed by IADPSG criteria in Phramongkutklao Hospital and the risk associated with GDM in selected population.

Materials and Methods

This was a descriptive study conducted at Phramongkutklao Hospital after approval by the Institutional Review Board, Royal Thai Army, Medical Department. Pregnant women who seek for antenatal care (ANC) at Phramongkutklao Hospital from December 2013 to September 2014 were informed and enrolled for universal screening for GDM with a 2-hour 75-gm OGTT at gestational age (GA) of 24 – 28 weeks. The test was scheduled for each patient and done at antenatal clinic following standard methods recommended by IADPSG[13]. Blood specimens were analyzed for plasma glucose in the laboratory of Phramongkutklao Hospital by using Cobas 6000 analyzer, Roche/Hitachi, Thailand. After exclude multi-fetal pregnancy and overt DM diagnosed by taking medical history or FPG from the test of ≥ 126 mg/dl, the remaining subjects were reviewed for age, gravida, parity, GA at first ANC, GA at screening, past and personal histories associated with DM, known risk factors of GDM including age ≥ 35 years, pre-gestational BMI ≥ 30 kg/m^2, previous history of GDM, history of DM in 1st degree relatives, previous unexplained fetal death or stillbirth, previous infant birth weight ≥ 4,000 g, and glucosuria or history of impaired glucose metabolism. Women with any of these risk factors were classified as high risk group. Average risk group was women aged 25-34 years. Women who had no mentioned risk were identified as low risk group. Primary outcome was the prevalence of GDM diagnosed by 2-hour 75-gm OGTT (IADPSG criteria). Secondary outcome was the

risk factors for GDM between normal and GDM women.

Statistical analysis

Based on a prevalence of GDM at 23% in HAPO study[14], a total of 355 participants were needed in this study. Data were analyzed using IBM SPSS statistic 19.0. Characteristics data of population will be presented with number, percentage, average, standard deviation. Continuous data were compared using t-test or Mann-Whitney U test, while categorical data were compared using chi-square or Fisher's exact test. P< 0.05 was considered statistical significant difference.

Results

Of all women who went to ANC clinic at Phramongkutklao Hospital in the study period, 397 women were interested and provided informed consent for the study. Three hundred and twenty-five pregnant women were finally recruited while 54 patients were excluded due to loss follow up (38), abortion (9), twin pregnancy (1), overt DM after test (1) and change their mind (6). Table 1 shows the demographic data of the population. Mean age was 29.72 years. Primigravida comprised almost 40% of cases. All patients underwent screening at accurate GA (24-28 weeks). Demographic data between normal and GDM cases were compared in T-able 2. Prevalence of GDM diagnosed by IADPSG criteria was 21.8% (N=71).

Table 1. Demographic data of the population.

	N = 325	%
Age* (year)	**29.72 ± 4.76**	
< 25	49	15.08
25 - 29	108	33.23
30 - 34	120	36.92
> 35	48	14.77
Gravida		
1	129	39.69
2	127	39.07
≥ 3	69	21.24
Parity		
0	156	48.00
1	119	36.62
≥ 2	50	15.38
GA at First ANC* (weeks)	**12.07 ± 4.36**	
Corrected GA by:		
- LMP	292	89.84
- Ultrasound	33	10.16
GA at screening† (weeks)	**25.61 (24-28)**	

* Presented by Mean ± SD

† Presented by Median (range)

Table 2. Comparison of demographic data between non-GDM and GDM women.

	Non-GDM (N=254)	GDM (N=71)	P*
	N (%)	N (%)	
Age (year)	29.21 ± 4.52	31.54 ± 5.26	0.001*
Gravida			
1	106 (41.89)	23 (32.3)	
2	94 (36.94)	33 (46.48)	0.206†
≥ 3	54 (21.17)	15 (21.12)	
Parity			
0	130 (51.18)	26 (36.62)	
1	86 (33.86)	33 (46.48)	0.59†
≥ 2	38 (14.96)	12 (16.90)	
GA at First ANC (weeks)	12.27 ± 4.41	11.39 ± 4.12	0.156*
GA at screening (weeks)	25.61 (24-28)	25.63 (24-28)	0.924#
Plasma glucose (mean ± SD)			
FPG	80.72 ± 5.94	89.17 ± 9.40	< 0.001*
1-hr PG	134.74 ± 25.86	181.17 ± 26.20	< 0.001*
2-hr PG	106.17 ± 20.48	134.58 ± 30.38	< 0.001*
Abnormal plasma glucose			
Abnormal FPG	0	29 (40.85)	
Abnormal 1-hr PG	0	40 (56.34)	NA
Abnormal 2-hr PG	0	23 (32.39)	
Risk group			
Low risk	24 (9.46)	0	
Average risk	156 (61.26)	37 (52.11)	0.002†
High risk	74 (29.28)	34 (47.89)	

* t-test
# Mann-Whitney U test
† Chi-square test
NA = not available

There was no statistical significant difference when compared demographic data between two groups ($p > 0.05$) except for age ($p = 0.001$), which is one of known risk factors for GDM. However the mean ages in both groups were still lower than cut point risk for GDM (< 35 years) (Table 2). No pregnant women who established abnormal test was identified in low risk group and risk stratification was also significant different between non-GDM and GDM groups ($p = 0.002$). Known risk factors of GDM were compared and showed in Table 3. Only age ≥ 35 years showed significant difference ($p = 0.008$). Most other risk factors present in few cases; BMI ≥ 30 kg/m^2, previous unexplained fetal death/stillbirth, previous infant birth weight ≥ 4,000 g. Some factors were found only in one group; previous GDM, hypertension. Some factors were not even present; impaired glucose metabolism.

Table 3. Comparison of GDM Risk factors between non-GDM and GDM women.

	Non-GDM (N = 254)	GDM (N = 71)	P*
	N (%)	N (%)	
Age (year)	29.21 ± 4.52	31.54 ± 5.26	0.001*
BMI ≥ 30 kg/m^2	1 (0.39)	2 (2.82)	0.127†
Age ≥ 35 years	30 (11.81)	18 (25.35)	0.008*
Previous GDM	1 (0.39)	0	1.000†
DM in 1st degree relatives	37 (14.57)	14 (19.72)	0.254*
Previous unexplained fetal death/stillbirth	1 (0.39)	2 (2.82)	0.127†
Previous infant birth weight ≥ 4,000 g	1 (0.39)	1 (1.41)	0.398†
Glucosuria	6 (2.36)	4 (5.63)	0.117†
Impaired glucose metabolism	0	0	0
Hypertension	0	2 (2.82)	1.000†

* Chi-Square test

† Fisher's exact test

Discussion

Our study revealed the prevalence GDM among participated pregnant women at antenatal clinic at Phramongkutklao Hospital was 21.8% after universally screening was done by using IADPSG criteria, which was similar to the prevalence of GDM formerly reported by Rajavithi Hospital (23%)[14]. It was also comparable to the prevalence found from HAPO study[14] – 17.8% (9.3 - 25.5%) - which studied among 15 centers around the world using the same criteria. Some studies reported lower prevalence for GDM[5,15], such as, Kanthiya and colleages[5] found the prevalence in Bhumibol Adulyadej Hospital, at 2.6%. The difference in GDM prevalence from the study of Kanthiya and colleages[5] possibly due to their exclusion of those women (5,675 from 6,324) who identified as no risk factors (age < 30, had no fetal anomaly associated hyperglycemia, and had no clinical of impaired glucose) from the screening program. While in our study, we also included all women regardless of age.

From the demographic data (Table 1), we found that the risk-based group was significant different ($p < 0.05$) between non-GDM and GDM women. We suggested that risk stratification was benefit in screening program because there was no GDM in low risk group, thus the test might not be offered in these women. When compared in detailed for each risk factor, age was the only risk factor that associated with GDM. Although, other risk factors showed unremarkable p-value, this interpretation was limited due to number of cases for each risk factor was too low and some were not present in both compared groups. One previous GDM case was found only in non-GDM group but not found in GDM group, while hypertension case were identified only in GDM group. Only few cases had previous unexplained fetal death/stillbirth or previous infant birth. History of impaired glucose was not found in either group. We decided not to further analyze by using regression analysis.

Apart from diagnosis criteria and risk factor identification, adverse pregnancy consequences were interested in many recent studies[5, 16-18]. IADPSG criteria will rise prevalence of GDM 3-4 times compared with traditional criteria[16-19] (from 7-8%[20] to 21.8% in our study) while pregnancy outcome showed inconclusive results among studies. In the study of Kanthiya, et al[5], found that some adverse maternal and neonatal outcomes were showed when women diagnosed by IADPSG criteria compared with normal women including pregnancy induced hypertension, rate of primary cesarean section, low APGAR score at 5 minutes, neonatal hypoglycemia and NCIU admission

rate. Contrary, Bodmer-Roy, et al[16], found no statistical significant difference in adverse pregnancy outcome of women diagnosed by IDAPSG criteria compared with Canadian Diabetes Association criteria[16]. In our study, we did not follow up all pregnant women until the time of delivery for pregnancy outcomes. However, we were agreed with Bodmer-Roy that a cost-effectiveness study should be performed before applying IADPSG criteria universally[16].

According to this study, the number of sample size was calculated for determine the prevalence of GDM detected by IADPSG criteria and may be too low to identify the GDM risk factors. As mentioned, some risk factors were even not found in our study due to prevalence among selected population that recruited in this study was limited.

Conclusion

The prevalence of GDM detected by IADPSG criteria in Phramongkutklao Hospital was 21.8% (N = 71) and the risk factor for GDM was age ≥ 35 years.

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ความชุกของการเกิดเบาหวานขณะตั้งครรภ์ โดยใช้เกณฑ์ของ International Association of the Diabetes and Pregnancy Study Groups (IADPSG) ในโรงพยาบาลพระมงกุฎเกล้า

รัฐวิชญ์ สุนทร, ปริศนา พานิชกุล

วัตถุประสงค์ *: เพื่อหาความชุกของสตรีตั้งครรภ์ที่เป็นเบาหวานขณะตั้งครรภ์ตามเกณฑ์การวินิจฉัยของ IADPSG และปัจจัยเสี่ยงต่อการเกิดเบาหวานขณะตั้งครรภ์ ในสตรีที่มาฝากครรภ์ที่โรงพยาบาลพระมงกุฎเกล้า*

วัสดุและวิธีการ *: ทำการศึกษาระหว่างเดือนธันวาคม พ.ศ. 2556 ถึงเดือนกันยายน พ.ศ. 2557 ในสตรีตั้งครรภ์เดี่ยวที่ฝากครรภ์ก่อนอายุครรภ์ 28 สัปดาห์ทุกราย และไม่รวมสตรีตั้งครรภ์แฝดหรือสตรีที่ทราบว่าเป็นเบาหวานมาก่อนตั้งครรภ์ในการศึกษา โดยบันทึกข้อมูลอายุ จำนวนการตั้งครรภ์ อายุครรภ์ที่ตรวจคัดกรอง กำหนดคลอด ปัจจัยเสี่ยงของการเกิดเบาหวานขณะตั้งครรภ์ ประวัติในอดีต และประวัติส่วนตัว ซึ่งการตรวจจะใช้วิธี 75-gm OGTT เพื่อให้ได้ค่าความชุกของการเกิดเบาหวานขณะตั้งครรภ์*

ผลการศึกษา *: สตรีตั้งครรภ์จำนวน 325 รายที่เข้าร่วมการศึกษา มีอายุเฉลี่ย 29.72 ปี ซึ่งเป็นกลุ่มที่มีความเสี่ยงสูงต่อการเป็นเบาหวานขณะตั้งครรภ์ 108 ราย (ร้อยละ 33.23) ความเสี่ยงปานกลาง 193 ราย (ร้อยละ 59.38) และความเสี่ยงต่ำ 24 ราย (ร้อยละ 7.39) โดยมีความชุกของการเกิดเบาหวานขณะตั้งครรภ์ร้อยละ 21.8 ซึ่งใกล้เคียงกับการศึกษาที่เคยมีมาก่อน ปัจจัยเสี่ยงที่มีผลต่อการเกิดเบาหวานขณะตั้งครรภ์คือ อายุ 35 ปีขึ้นไป*

สรุป *: ความชุกของการเกิดเบาหวานขณะตั้งครรภ์โดยใช้เกณฑ์ของ (IADPSG) ในโรงพยาบาลพระมงกุฎเกล้าเท่ากับร้อยละ 21.8 และปัจจัยเสี่ยงของการเกิดเบาหวานขณะตั้งครรภ์คือหญิงตั้งครรภ์ที่มีอายุตั้งแต่ 35 ปี ขึ้นไป*