Prevalence of gestational diabetes mellitus in Rafsanjan: a comparison of different criteria

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Abstract

Background: Gestational diabetes mellitus (GDM) is common during pregnancy. This survey was designed based on the frequency of GDM among an urban population according to the American Diabetes Association (ADA) and the International Association of Diabetes and Pregnancy Study Groups (IADPSG) criteria.

Methods: We included all pregnant women who were admitted to a gynecology clinic from September 2012 until May 2013. The fasting blood sugar (FBS) was measured. Those having FBS$\geq$ 126 mg/dl were excluded from the study. All women underwent a standard OGTT (oral glucose tolerance test) by ingesting 75g of glucose in the 24th to 32nd week of their pregnancy.

Results: Two hundred ninety pregnant women with a mean±SD age of 27.72±5.091 years were included in the study. The mean±SD FBS, blood glucose one hour and two hours after ingesting 75g of glucose were 82.48±9.41, 146.86±34.22 and 114.21±27.79 mg/ dl, respectively. Based on the criteria of the ADA, 9.3% (n= 27) of the admitted patients suffered from GDM. For the IADPSG and the WHO, those numbers were 31% (n= 90) and 15.2% (n= 44), respectively.

Conclusion: The prevalence of GDM was 1.5-times and 3 times higher when the IADPSG based data were compared to those of the WHO or the ADA.

Keywords: Gestational Diabetes Mellitus; ADA; HAPO; IADPSG.

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Introduction

Gestational diabetes mellitus (GDM) is defined as any stage of hyperglycemia which is first expressed or diagnosed during pregnancy. GDM is the most prevalent disorder during pregnancy, resulting in disability and perinatal complications as well as neonatal problems (1-3).

The prevalence of this condition differs vastly among countries (4). The occurrence of GDM is also expected to increase in upcoming years; its prevalence in the USA and Turkey is calculated to be 7% and 4.48%, respectively (5-7). In Iran, the numbers vary between provinces from 1.3% to 8.9% (8). In 2011, Mexico reported the prevalence of GDM to be 10.3% according to the ADA index (30.1% using the IADPSG criteria) (9).

As well as being highly prevalent, GDM can be considered a predisposing factor for type 2 diabetes. Thus, any attempt to diagnose GDM earlier seems critical (10,11).

In 1997, the American Diabetes Association (ADA) proposed indexes for the diagnosis of GDM in the 24th week of pregnancy (1). The comprehensive research known as HAPO (Hyperglycemia and Adverse Pregnancy Outcome) conducted in 2008 in

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9 countries showed that even in mothers with normal plasma glucose values (according to the ADA index), there is still a strong correlation between diabetes complications and plasma glucose levels. The findings of this research were interpreted, and in 2011 the International Association of Diabetes and Pregnancy Study Groups (IADPSG) introduced new criteria for the diagnosis of GDM which seem to be more sensitive (12). Although the ADA supports and recommends its use, the new criteria are not yet widely used by doctors (13). The HAPO project results showed that for every 6.9 mg/dl increase in the blood glucose, the chance of complications from GDM, such as macrosomia, cord-blood serum C-peptide levels and primary cesarean delivery, multiplies by 1.38, 1.55, and 1.1 times, respectively. This research also concluded that the existing criteria do not predict the complications of diabetes sufficiently (7,12).

Taking into the account the high prevalence of GDM in Iran, this survey was designed to calculate the frequency of this disease among urban populations according to the ADA and IADPSG criteria.

Methods

We included all pregnant women who were admitted to the gynecology wards of Rafsanjan hospitals from September 2012 until March 2013. After their first gynecological examination, the participants signed written informed consent forms for participation in the study. This study was approved by the Ethics Committee of Tehran University of Medical Sciences.

The fasting blood sugar (FBS) was measured after the first visit. Those having FBS $\geq$ 126 mg/dl were assumed to have apparent diabetes mellitus and were excluded from the study. Other exclusion criteria were a history of gestational diabetes, thyroid, liver, heart or renal dysfunction and a history of consuming any kind of corticosteroids. Standard oral glucose tolerance test (OGTT) was done by ingesting 75g of glucose in the 24th to 32nd week of pregnancy. If the patient was admitted to the ward after her 24th week of pregnancy, her FBS level was read from her hospital document and then OGTT was performed. All of the tests were done in a single laboratory. All data were recorded on a checklist.

Data were analyzed using SPSS 20 and were reported as average, standard deviation and percentages. T-test was used to compare the quantitative indexes. Chi square was used to compare the categorical variables between different criteria. Logistic regression tests were done to evaluate the correlation between different variables with the diagnosis of GDM. P value<0.05 was considered as statistically significant.

Results

Two hundred ninety pregnant women with the average age of 27.72±5.091 years in age 1.91±1.02 gravidity (from 1 to 6, with a median of 2), and 0.73±0.84 parity (from 0 to 4 with a median of 1) were included in the study.

The mean±SD of BMI at the time of enrolment was 27.62±4.58 and the mean±SD of systolic and diastolic pressures were 109.11±12.27 and 63.65±6.57 mmHg, respectively. Family history of diabetes type 2 was present in 31% of the participants

Table1. Correlation between GDM and known quantitative risk factors

Variable	ADA (Mean±SD)			IADPSG (Mean±SD)			WHO (Mean±SD)	
	Negative GDM	Positive GDM	p	Negative GDM	Positive GDM	p	Negative GDM	Positive GDM
Age	27.6± 5	29.1±5.7	0.100	27.3±4.9	28.6±5.3	0.050	27.4±4.9	29.4±5.7
BMI	27.5±4.6	28.8±3.9	0.100	26.9±4.3	29.1±4.7	<0.001	27.4±4.7	28.7±3.4
Parity	0.7±0.8	0.9±1	0.100	0.7±0.7	0.8±0.9	0.100	0.7±0.8	0.9±1
Gravid	1.9±1	2.2±1.1	0.100	1.9±1	1.9±1	0.100	1.9±1	2.1±1
Gestational Age	26.7±6.6	25.0±7	0.100	27.1±6.6	25.4±6.6	0.400	27.01±6.3	23.9±8

Table 2. Correlation between GDM and categorical risk factors

Variable	ADA N (%)			IADPSG N (%)			WHO N (%)	
	Negative GDM	Positive GDM	p	Negative GDM	Positive GDM	p	Negative GDM	Positive GDM
Preeclampcy	0 (0)	1(0.34)	0.09	0(0)	1(0.34)	0.30	0(0)	1(0.34)
Hx of macrosomic infant	0(0)	4(1.37)	0.50	1(0.34)	3(1)	0.70	0(0)	4(1.37)
Hx of GDM	1(0.34))	2(0.69)	0.02	0(0)	3(1)	0.02	1(0.34)	2(0.69)
FHx of DM	77(26.5)	10(3.5)	0.40	50(17.2)	37(12.7)	0.01	17(5.9)	7024)
Hx of HTN	0(0)	5(1.7)	0.50	0(0)	5(1.7)	0.60	0(0)	5(1.7)

(n= 90). From the patients with at least one delivery (n= 155), 1.9% and 2.5% had a history of GDM and delivery of macrosomic infant respectively. Fifteen percent of the participants (n= 43) had FBS≥ 92mg/dl.

The mean±SD FBS, blood glucose one hour, and two hours after ingesting 75 g of glucose were 82.48±9.41, 146.86±34.22, and 114.21±27.79mg/dl, respectively.

Based on the criteria of the ADA, 9.3% (n = 27) of the admitted patients suffered from GDM. For the IADPSG and the WHO, those numbers were 31% (n= 90) and 15.2% (n= 44), respectively. Tables 1 and 2 demonstrate the correlation between GDM and known pregnancy risk factors.

In the regression analysis, according to the new criteria, blood sugar did not regress with either gravidity (p= 0.99), parity (p= 0.27), or age of pregnancy (p= 0.87). However, in the logistic regression, the only significant variable was the patient's history of type 2 diabetes (p= 0.009, OR= 2.02 (95% CI: 1.19-3.44)).

Discussion

This study compared ADA and IADPSG criterion in a sample of pregnant women from Rafsanjan in 2012 and 2013. We calculated the prevalence of GDM to be 9.3%, 15.2%, and 31%, respectively based on the ADA, IADPSG and WHO criteria. As reported in other studies, lowering GDM's diagnosis cut-off resulted in a higher prevalence (The ADA had the highest cut-off and thus the least prevalence). The prevalence of GDM was 1.5 times and 3 times higher based on the IADPSG criteria than based on the WHO and ADA criterion. It is

quite obvious that having a less expensive and more sensitive screening test would produce the best desired result. As in IADPSG and ADA, 3 and 4 blood sugar assessments are required. Although their diagnostic cut-offs are different, all patients reported to have GDM by IADPSG criteria had the same results as ADA; therefore, it seems that using IADPSG is more reasonable. Whether this triple increase in GDM prevalence is in line with any change in mother and neonatal complications after pregnancy, needs to be determined in future studies.

Similar studies had been done in various countries. For example, in Japan, the prevalence of GDM was reported to be 2.4% and 6.6%, using previous and new criteria, respectively. The prevalence of macrosomia was found to be significantly different in normal patients based on the ADA criteria compared to a similar group using IADPSG indexes. The researchers concluded that using the new method would increase the cases of GDM at least 2.7 times (14).

In another study done in Ireland, the prevalence of GDM changed from 9.4% to 12.4% using the IADPSG instead of the WHO criteria (15). In a similar study conducted in the UAE, the prevalence of GDM was reported to be 12.9% according to the ADA and 37.7% according to the IADPSG. It was concluded that lowering the cut-off of two-hour glucose blood according to the IADPSG was the reason for the increase in GDM prevalence, making it the most important index (16).In contrast with the results of previous studies, our work showed that the number of positive cases of the

FBS test, 1h OGTT, and 2h OGTT were 52, 48, and 24, respectively. Moreover, 43 patients had an FBS value of more than 92 mg/dl prior to OGTT, which is half the number of GDM cases. These findings show that the sensitivity of the FBS test seems to be high. On the other hand, in our study, the correlation between diabetes and a woman's BMI, a history of diabetes in the family and age were significant. Based on these findings and the fact that the treatment of choice for GDM is a modified diet, the cost effectiveness of GDM screening is more reasonable. One of our limitations in this study was the absence of BMI score documentation before pregnancy. We considered the BMI of the patients during pregnancy an independent variable; thus, our interpretations could be false.

Conclusion

This study was designed to compare the prevalence of GDM with respect to different criteria. According to the ADA, the WHO, and the IADPSG, the prevalence of GDM was calculated to be 8%, 15.1% and 21%, respectively. The prevalence of GDM was 1.5-times and 3 times higher when the IADPSG based data was compared with those of the WHO or the ADA.

As a final point, we suggest that GDM screening be done using IADPSG criteria.

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