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Comparison of Universal and Risk Factor Based Screening Strategies for Gestational Diabetes Mellitus.

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Abstract:

Objective: Early diagnosis of gestational diabetes mellitus (GDM) can avoid some diabetes-related complications.
Aims: To compare the results of oral glucose challenge test (OGCT) in high risk group with low risk group in Iran .
Materials and Methods: In a prospective study, universal screening for GDM was performed on all pregnant women with a 50 g OGCT with 140 mg/dl cut-off point. Data were analyzed between positive and negative groups.
Results: A positive 50 g OGCT was obtained in 16.7% of the women. In 4% of women, a diagnosis of GDM was established by the subsequent OGTT 75g. 50.7% of patients with positive OGCT 50 g would not have risk factors. Maternal age>30 years (P<0.0001), recurrent abortion (p=0.04), family history of diabetes (p=0.0004), history of diabetes in previous pregnancies (P<0.0001), glucosuria (P<0.0001), macrosomia (p=0.02) and previous congenital fetal malformation (p=0.001) were significantly different between the positive GCT group and the normal pregnant women. But the mean number of parity, gestational age, hypertention and still birth were not significantly different between the positive GCT group and the other group.
Conclusion: The results suggest that the incidence of abnormal OGCT and prevalence of GDM in Iran is comparable to the reported range in other countries and most but not all of the worldwide recognized risk factors were valid for our population. Therefore, universal screening for GDM identify a higher number of GDM than risk factor based screening.

Key Words: Prevalence, Gestational diabetes mellitus, Oral glucose challenge test, Risk factors, Iran.

Introduction:

Gestational diabetes mellitus (GDM) is defined as a degree of Glucose intolerance with onset or first recognition during pregnancy [1]. The prevalence of gestational diabetes differs based on the White, African or American, Latina and Asian populations[2.3]. There is evidence that even mild maternal hyperglycemia is a risk factor for fetal macrosomia, neonatal hypoglycemia and hyperbilirubinemia [4,5]. With the aim of diagnosis gestational diabetes, two steps have been standardized: screening and diabetes confirmation [6]. Since1973 when 1 hour 50 g glucose loading test (GLT) was first reported [7], this screening test for gestational diabetes has become incorporated into the most practitioner's routine prenatal care. More recently consensus was reached at the third International Workshop conference to support an optimal screening threshold of 140 mg/dl [8]. The 50 g 1 h oral Glucose challenge test (OGCT) remains the screening method of choice recommended by American Diabetes Association (ADA) for women with risk factor [1]. In UK and Northern Europe the risk factor-based screening procedure fallowed by a 75 g OGTT as the diagnostic test was used. However, Universal screening with 50 glucose load has also been proposed [9].

The main objective of this study was to evaluate the prevalence of GDM in a non-selected Iranian population and to compare the results of OGCT in high risk group and low risk group.

Materials and Methods:

Between March 2003 to March 2005, in a prospective study, universal screening for GDM was performed for all singleton pregnant women who were referred from private clinics and community health care centers to Ali-Ebne-Abitaleb Hospital in Zahedan University of medical sciences, Iran. Approval of the local ethics committees was obtained and a written consent was gained from the participating women. The exclusion criteria were pre-gestational diabetes. All women examined in this study were born in Iran and were of Persian ethnicity. The recognized risk factors with increased risk for GDM were largely derived from population of European extraction.

The assessments of the patients included the patient's medical history, calculation of gestational age, obstetric ultrasound scan and measurement of fasting glucose levels.

The patients histories were taken on their first visit to prenatal care in order to identify risk factors including age ≥30 years, pre gestational BMI ≥30 kg/m2, personal history of gestational diabetes, family history of diabetes, previous fetal macrosomia (birth weight ≥4000 g), previous still birth with no apparent cause, recurrent miscarriage (≥2) and previous congenital malformation, hypertention ≥ 140/90 and glucosuria. Then the 50 g OGCT was performed for the patients having risk factors at the first antenatal visit regardless of the fasting state. If the initial screening test was negative and for all women without risk factors, OGCT was performed with the 50-g, 1-hour glucose challenge test between 24 to 28 weeks of gestation of 140 mg/dl or higher followed by a 75 g, 2-h OGTT within 1 weeks of

abnormal screening test and after an appropriate 3 days carbohydrate load and overnight 8-12 h fasting, which was considered as the actual diagnostic test for GDM. Glucose concentration was measured at fasting state 1 and 2 h after 75 g glucose loading test. A patient was considered having GDM when 2 or 3 of the OGTT values were at or above thresholds (FBS≥95, 1-h ≥180, 2h≥155) [10].

Statistical analysis was performed using SPSS 11 for Windows. Data were analyzed using Chi square and Fisher exact test. Non parametric data were analyzed by the Mann-Whitney U test. P< 0.05 was considered statistically significant.

Results:

The study included 400 cases with singleton fetuses; Subject's characteristics are shown in table1. The incidence of GDM diagnosed overall in all patients with 50 g OGCT was 67 (16.7%). To confirm the GDM, 75 g GTT was performed in positive OGCT. The results showed that 16 cases (4%) were diagnosed as GDM ,using 75 g GTT.

Among the 400 pregnant women, 141 cases (35.2%) had risk factors of GDM of whom 24.8% had only one risk factor, and 10.4% had more than one risk factor. Of 333 women who had normal 50 g GCT, 225 (67.6%) pregnant women had no risk factors and 108 (32.4%) cases had at least one risk factor for GDM.

There was a difference in the result of GCT between groups with and without risk factors. (p<0.001)

There was a significant association between maternal age and the result of OGCT.In other words, as maternal age increased, the probability of positive OGCT also increased (p<0.001) (Table 1).

The number of primigravids was significantly different between the positive GCT group and the normal pregnant women (p<0.001)(Table 1).

The mean number of parity, gestational age, systolic blood pressure, number of still birth and BMI≥30 (p=0.06), were not significantly different between the positive OGCT group and the normal pregnant women.

On multiple logistic regression analysis, parity was not found to affect GDM prevalence significantly.

Women with positive GCT 50 g group were more likely to be over the age of 30, having a positive family history of diabetes (in first degree relatives), history of abnormal glucose metabolism, glucosuria, macrosomia and Previous congenital fetal malformation and recurrent abortion (Table 2). If selective screening criteria for GDM had been applied, 50.7% of patients with positive GCT 50 g would have been missed.

Discussion:

In this study which applied universal screening for GDM in a referral hospital in Iran GCT was positive in 16.75% of cases, while the true prevalence of GDM was 4% and 50.7% of positive OGCT had no risk factor of GDM and 56.3% of positive GTT 75 g (GDM) did not have any risk factors of GDM. There are no previous study of GDM from this part of the our country. The prevalence of abnormal OGCT (16.75%) in this study was similar to other studies reported for most populations [4,11,12].

Table 1: Characteristics of the study subjects

Factors	Negative 50 g test	Positive 50 g test	P value
Number	333	67	
Age (years)	24.8 ± 6.2	29.1 ± 6.8	< 0.001
Primigravidity (%)	68 (20.4%)	23 (34.3%)	< 0.001
BMI (kg/m2)	24.8 ± 5.3	25.2 ± 4.9	NS
Height (cm)	155.2 ± 6.8	156.4 ± 6.5	NS
Systolic BP(mmHg)	110 ± 15	115 ± 12	NS

Data expressed as mean ± SD or n (%)

Table 2: Risk factors in the screened population (50 Gram GCT)

Risk factor	Negative Test	Positive Test	Odds Ratio (95% CI)	P value
Number	333	67		
Age > 30 y	64 (19.2%)	27 (40.3%)	3 (1.8-5)	0.000
Family history of diabetes	28 (8.4%)	14 (20.9%)	2.9 (1.4-5.8)	0.004
Previous history of GDM	4 (1.2%)	8 (11.9%)	11.2(3.3-38.2)	0.000
Obeisity BMI > 30 Kg/m2	9 (2.7%)	5 (7.5%)	3(0.9-9)	NS
History of macrosomia >4000g	6 (1.8%)	5 (7.5%)	4.4 (1.3-14.9)	0.02
Glycosuria	4 (1.2%)	8 (11.9%)	11.2(3.3-38.2)	0.000
History of still birth	12 (3.6%)	3 (4.5%)	1.3(0.3-4.5)	NS
Recurrent abortion	70 (21%)	22 (32.8%)	1.8 (1-3.3)	0.04
Hypertention, preeclampsia	8 (2.4%)	4 (6%)	2.6 (0.8-8.3)	NS
Previous congenital malformation	1 (0.3%)	5 (7.5%)	26.8(3.1-233)	0.001

Previous Iranian studies of pregnant women in Tehran and Shahrood University found a similar GDM incidence [13,14]. These data suggest that the incidence of GDM in Iran is comparable to reported range 1-15% with wide-ranging differences between countries [1,15,16,17,18]. Moreover, within the same country, the prevalence of GDM varies in relation to ethnicity [3,19,20], the screening methods and the diagnostic criteria used [21].

Vogel N et al. in their review show considerable differences between published guidelines concerning screening for GDM varying from screening when clinically indicated to universal screening [22].

According to Naylor et al [23] screening all pregnant women is expensive, time-consuming and uncomfortable for patients. American Diabetes Association recommends selective screening with 50 g OGCT for pregnant women having risk factors [1]. Some authors reported that selective screening on the basis of historical risk factors would miss 40% to 50% of women with GDM [7,13] and therefore it

is recommend that all women should undergo a screening test. Coustan et al [24] found that 35% of GDM would have remained undiagnosed using 50 g OGCT in all pregnant women over 30 years of age and in younger women with risk factors. In this study, approximately 50% of women with GDM would have been missed using the selective screening based on evaluation of risk factors.

In this study, positive family history for diabetes, maternal age, previous history of GDM, History of macrosomia, glycosuria, recurrent abortion, previous congenital malformation were all positively associated with positive OGCT. Family history of diabetes has a strong correlation with occurrence of GDM [25]. One study reported a family history of diabetes in 39.6% women with GDM compared to only 18.6% in those with normal OGCT (approximately 2 folds) [26] that is similar to the results of this study.

The prevalence of GDM is also affected by previous pregnancy outcome. Neylor et al found glucose intolerance in 14.5% of women who had adverse obstetric outcome [23]. In this study the prevalence of positive OGCT steadily increased in women with recurrent abortion and previous pregnancy with macrosomia and this is similar to the results of other studies [5,12].

There is increased frequency of hypertensive disorders and obesity in women with GDM [27,28]. In this study the prevalence of GDM was not higher in hypertensive than in normotensive women; furthermore, frequency of obesity did not increase in positive OGCT (P=0.06). Further studies with screening of larger population are needed to establish correlation between obesity and positive OGCT.

In conclusion Glucose intolerance is relatively common during pregnancy and should be assessed after proper risk stratification. We found that the incidence of positive OGCT and GDM in the Iranian population was similar to that of the developed countries and most but not all of the worldwide recognized risk factors were valid for our population. More studies are suggested to investigate the presence of risk factors for GDM depending on ethnicity. Therefore, a 50g OGCT for all pregnant women appear to identify a higher number of GDM than risk factor based screening.

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