The Use of Glucose Screen Test Alone in Diagnosing Gestational Diabetes Mellitus in Bahrain-Preliminary Report

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Objective: To establish a cutoff point where gestational diabetes mellitus (GDM) can be diagnosed based on the one-hour glucose challenge test (GCT) alone without doing the Oral Glucose Challenge test (OGTT).

Setting: Ministry of Health, Bahrain.

Design: Retrospective.

Method: All pregnant ladies with positive screen test of at least 7.8 mmol/l in 2002 were identified and their subsequent oral glucose challenge test (OGTT) evaluated.

Result: Two thousand six hundred and forty-eight ladies with a positive screen test were identified. Five Hundred and sixty-two had GDM and 537 had impaired glucose tolerance test (IGT). The ROC curve yielded a cutoff value of 11.05 mmol/L with high specificity and low false positive results.

Conclusion: GDM can be diagnosed from the GCT using a value of 11.05mmol/L.

The current debate over the screening and diagnosis of gestational diabetes mellitus (GDM) is overwhelming and confusing. Many prestigious researchers have doubted the currently used National Diabetes Data Group Criteria applied in North America and the Arabian Gulf Region as well. Their arguments ranged from doubting the methodological origin of the screening method to the impracticality ending with the economic aspect of the test[1].

This argument will not be cut off short by mere criticism of flaw methodology or the expensive test technology.

Gestational diabetes is defined as glucose intolerance with the onset or the first recognition during pregnancy[2].

Screening for GDM in North America is based on 50g one hour glucose challenge test (GCT) performed routinely during the 24-28 weeks of gestation. To screen all pregnant women or to confine this screening test to high-risk group remains debatable. The threshold for abnormal screen is ≤140mg/dl or 7.8 mmol/l[2].

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For women who screened positive on GCT, 100g three hour oral glucose tolerance test (OGTT) is performed. Different screening and diagnostic strategies recommended by the WHO are used outside North America[3].

In Bahrain, the threshold value for 50g GCT is 140mg/dl. For women who screened positive on GCT, 75g OGTT is performed with three hours diagnostic readings.

In true life, as practicing physicians, the added value of performing OGTT to patients with high GCT is questioned. Moreover, the delay in the lifestyle modification therapy in those patients pending the OGTT results is unjustifiable. Another drawback will be subjecting those patients to the unnecessary inconvenience of the nasty OGTT with the prerequisite of overnight fasting and all other test conditions. To make it more appealing, the cost of those unnecessary tests may be eliminated from the budget[4].

On the other hand, not performing OGTT in patients with high positive screen may lead to over diagnosis and over treatment of gestational diabetes.

The advantages versus the disadvantages have to be weighed and a universal decision should be evolved based on scientific, social and economic grounds.

Landy et al have recommended the cutoff value for the diagnosis of GDM by GCT is 10.3 mmol/l based on a case-control study. In that study, the receiver operating characteristic (ROC) curve analysis was used to illustrate the relationship between the sensitivity and specificity of the GCT and yield a range of cutoff values. The cutoff value of 10.3mmol/l was chosen based on its correspondence to high specificity (95%) and low false positive rate (4.1%)[5].

The Canadian Diabetes Association Clinical Practice Guidelines Expert Committee advocated this cutoff value as means of diagnosing GDM by GCT[6].

This preliminary report describes the initial research designed to establish the cutoff value for diagnosing diabetes in pregnancy in Bahrain. Later report will describe method of implementations of such value in Bahrain.

The aim of this study is to establish the cutoff value for the diagnosis of GDM based on GCT in Bahrain.

METHOD

All pregnant ladies in Bahrain regardless of their obstetric history are offered the GCT at 24-28 weeks of gestation. It is not until 2004 that GCT was performed earlier in pregnancy if the lady was in the high risk category.

All pregnant ladies with a positive screen test (GCT ≥ 7.8 mmol/dl) in the Kingdom of Bahrain in the year 2002 have been identified. The OGTT of these patients were retrieved and documented through Ministry of Health statistics department.

The patients were then grouped according to their OGTT results into four groups "GDM", "Impaired Glucose Tolerance (IGT)", "Normal" and "No documentation of results".

GDM was diagnosed (according to WHO criteria) if two abnormal OGTT values were present. IGT was diagnosed if one abnormal OGTT value was present. If no documentation of OGTT was present then the patient was excluded from the study.

The receiver operator curve (ROC) was constructed to illustrate the relationship between specificity and sensitivity and yield cutoff values. To increase the precision of the test in confirming for GDM diagnosis, ROC calculations considered the IGT group as non-d………………………………..

iabetics. A prevalence rate of 13% was used in calculating positive and negative predictive values.

RESULT

11383 pregnant females registered in Bahrain governmental hospitals in 2002. Out of them, 8050 were screened for GDM using GCT in 2002. Two thousand six hundred and forty-eight subjects showed positive results (Table 1).

Table 1: Number and Percentage of Patients According to Their OGTT Results and Nationality

	Bahraini	Non-Bahraini	Total
ND(Not documented)	284	161	445
GDM(Gestational Diabetes)	392	172	564
IGT(Impaired Glucose Tolerance)	377	161	538
Repeat GCT	10	8	18
Normal	790	293	1083
Total	1853	795	2648

The mean age for the study group was 31.9 with a standard deviation of 5.96 years. The mean age for the GDM group was 33.7 with a standard deviation of 5.9 years. The IGT group had a mean age of 32.1 with a standard deviation of 5.8.

The mean age for the normal group was 30.8 with a standard deviation 5.8. The mean age for the Bahraini group was 32.2 and SD of 6.0. For the Non-Bahraini group the mean age was 31.1 and SD of 5.7. The mean age for the Bahraini GDM group was 34.3 with SD of 5.8 and the mean age for the GDM Non-Bahraini group was 32.3 years with SD of 5.9.

The number of Bahraini ladies with GDM was 392; the number of IGT in Bahrainis was 377. The number of GDM Non-Bahraini patients was 172 and IGT was 161.

There is significant statistical difference (P<0.0001) between mean ages in the GDM and the normal groups.

Five hundred and sixty-four patients had GDM. One thousand and eighty-three patients had normal OGTT by WHO criteria. The prevalence of GDM in this study was 4.9% (564/11383). The prevalence of abnormal glucose tolerance was 9.6% (564+538/11383).

The total number of Bahraini ladies in this study was 1853. Two hundred and eighty-four were excluded for OGTT incompletion and 10 for GCT repeat. The total number of

Non-Bahrainis was 795, 161 were excluded for OGTT incompletion and 8 for GCT repeat.

Analysis of ROC curve (Figure 1) showed several cutoff values (Table 2). A value of 11.05 mmol/l was chosen to be the lower possible cutoff point, at which the sensitivity and specificity were 26.8% and 97.4% respectively. The selection was based on high likelihood ratio with high specificity (Table 2).

The percentage of patients with GCT ≥ 11.05 and GDM is 62% (151/243) higher than with GCT less than 11.05 and GDM 17 % (411/2405).

ROC Curve
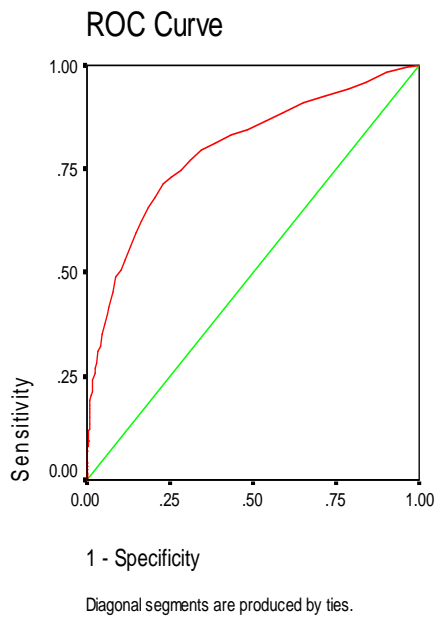

Diagonal segments are produced by ties.

Figure 1: Diagonal Segments Are Produced by Ties

Table 2: Suggested Cutoff Points (IGT Included as Normal)

Positive if Greater Than or Equal To	Sensitivity	1 - Specificity	Likelihood ratio
7.95	0.982	0.904	1.09
8.65	0.846	0.485	1.74
9.05	0.773	0.313	2.47
9.75	0.594	0.148	4.01
10.05	0.507	0.104	4.88
10.15	0.489	0.086	5.69
10.25	0.452	0.079	5.72
10.35	0.417	0.067	6.22
10.45	0.399	0.06	6.65
10.55	0.374	0.054	6.93
10.65	0.351	0.045	7.80
10.75	0.324	0.039	8.31
10.85	0.309	0.033	9.36
10.95	0.282	0.029	9.72
11.05	0.268	0.026	10.31
11.15	0.255	0.023	11.09
11.25	0.241	0.018	13.39
11.35	0.211	0.017	12.41
11.45	0.204	0.014	14.57
11.55	0.193	0.01	19.30
11.65	0.181	0.01	18.10
11.75	0.17	0.009	18.89
11.85	0.163	0.008	20.38
11.95	0.151	0.008	18.88
12.05	0.135	0.008	16.88
12.15	0.124	0.007	17.71
12.25	0.117	0.006	19.50
12.35	0.106	0.004	26.50
12.45	0.101	0.004	25.25
12.55	0.096	0.004	24.00
12.65	0.092	0.004	23.00
12.75	0.083	0.003	27.67
12.9	0.076	0.001	76.00

DISCUSSION

This study intended to examine the GCT as a diagnostic test in the prediction of GDM development. Insufficient data of relevant risk factors for GDM renders this study incomparable. It is the intention of the authors however to expand this study further and to elaborate more on the ability of the GCT to predict GDM. Case-Control study will be implemented in achieving this goal in which the ROC curve will be structured to delineate the appropriate cutoff values.

Many subjects were missed from this study; nevertheless, it was able to provide a cutoff value after which GDM can be safely and confidently diagnosed.

Landy et al have demarcated the cutoff value to be 10.3mmol/L in their study, while in this study the cutoff value was 11.05mmol/L after eliminating the IGT group and considering them as non-diabetics[6]. The authors had an impression that the cutoff value will be less than that in the Landy study considering the high diabetes and GDM prevalence in the Bahraini population. This was not true, however. We believe that many factors have contributed to this including, the type of the study, methodology, the big number of missing subjects who could be high risk group to start with, the large number of foreigners and the unavailability of control.

The prevalence of GDM in this study was found to be 4.9% which is comparable to other regional studies. In Saudi Arabia, the prevalence was 6%[7]. There was a statistically significant age difference between the GDM and the normal group. Older age is a documented risk factor for GDM. This study confirmed this.

CONCLUSION

The results of this study may make us ponder to consider the value proposed as a cutoff for diagnosing diabetes in pregnancy without the need for performing the OGTT. The authors' next step will be to perform case-control study to reaffirm cutoff values.

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