

Original Article

One step method for diagnosis of gestational diabetes mellitusK Chandramathy¹, N Umadevi², C H Mini³, E Sulu⁴, Neetha Sreedharan⁵

To study the detection rate of gestational diabetes mellitus (GDM) with 75gm Oral glucose tolerance test (OGTT) compared with 100gm OGTT and to study the effectiveness of 75gm OGTT both as a screening as well as diagnostic test. This study was performed at the Government Medical College, Calicut, Kerala. Consecutive 500 pregnant women with gestational age between 20 and 28 weeks attending the antenatal clinic were advised to do 100 gm OGTT. All of them were instructed to come after one week in an empty stomach for 75gm OGTT as recommended by WHO. Results were statistically analysed with Kappa measure of agreement. Total of 480 women underwent both 100gm OGTT and 75gm OGTT. Of the 14 women diagnosed as having GDM with 100 gm OGTT, 13 (94.8%) were positive with 75 gm OGTT which is statistically significant. Of the 447 women negative for GDM according to WHO criteria only one was found to be positive with 100gm OGTT. With 75 gm OGTT 33 women were found to be positive for GDM. The prevalence of GDM with 75 gm OGTT (6.9%) was more than twice that of 100 gm OGTT (2.9%). Diagnosis of GDM based on 75gm OGTT was found to be more economical. The two step method of screening with GCT (50gm glucose) and then diagnosing GDM based on the cut off values with 100gm OGTT is more cumbersome as the pregnant women have to visit the clinic at least twice for testing and the number of blood samples drawn is five. In this study the prevalence of GDM was 6.9% which was comparable to the recent results. Hence we suggest a single test with 75gm oral glucose and diagnosing GDM if 2 hour plasma value is ≥ 140 mg/dl as recommended by WHO.

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Key words : OGTT, gestational diabetes, glucose intolerance.

Gestational diabetes mellitus is defined as carbohydrate intolerance with recognition or onset during pregnancy, irrespective of the treatment with diet or insulin. Women diagnosed to have gestational diabetes mellitus (GDM) are at increased risk of future diabetes predominantly type II diabetes as are their children. Thus GDM offers an important opportunity for the development, testing, and implementation of clinical strategies for diabetes prevention. Timely action taken now in screening all pregnant women for glucose intolerance, achieving euglycaemia in them and ensuring adequate nutrition may prevent in all probability, the vicious cycle of transmitting glucose intolerance from one generation to another.

A number of screening procedures and diagnostic criteria (ADA, WHO, CDA, NDDG, and Australian criteria) are being followed in the same as well as different countries. American Diabetes Association recommends step

procedures for screening and diagnosis in selected population. In the Indian context, screening is essential in all pregnant women, as the Indian women have an 11 fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women.

Hence universal screening during pregnancy has become important in our population. For this we need a simple procedure which is economical and feasible. Hence a study is needed to find out a 'one step procedure' which serves both as a screening as well as a diagnostic tool at the same time.

This study aims to study the effectiveness of 'one step method of diagnosis of GDM' and to implement the test in this institution.

MATERIAL AND METHODS

This study was carried out in the Government Medical College, Kozhikode from November 2009 to April 2010. Consecutive 500 antenatal women attending antenatal clinic with gestational age between 20 – 28 weeks of pregnancy were selected for the study. Women who came with a glucose challenge test with 50gm glucose were excluded from the study. Details of family history of diabetes, previous pregnancies and socioeconomic status were obtained.

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Blood pressure and body mass index were recorded. All of them were requested to do 100gm OGTT and were advised to come after one week with an empty stomach for 75gm OGTT. On the day of review, irrespective of the 100 gm OGTT results all of them were subjected to 75gm OGTT with fasting and 2 hour postprandial plasma glucose as recommended by WHO. The plasma glucose was estimated by glucose oxidation and per oxidation GOD – POD method. Of the 500 women under study, 480 were responded.

The results were analysed and GDM was diagnosed according to ADA criteria as well as WHO criteria as given in Table 1 and Table 2 respectively. American Diabetes

Table 1 — Showing Carpenter and Couston Criteria for Diagnosing Gestational Diabetes Mellitus

Time of testing	Plasma glucose	
	100g OGTT	75g OGTT
Fasting	95mg/dl	95mg/dl
1 hour	180mg/dl	180mg/dl
2 hours	155mg/dl	155mg/dl
3 hours	140mg/dl	

Table 2 — Showing WHO Criteria for Diagnosing Gestational Diabetes Mellitus

	Fasting plasma glucose (mg/dl)	2-hours plasma glucose (mg/dl)
IGT	<126	140- 200
Diabetes	>126	>200

Association has adopted Carpenter and Couston criteria.

Two or more of the venous plasma values must be met or exceeded for a positive diagnosis.

If the fasting plasma glucose more than 126mg/dl and/or 2 hours postglucose more than 200mg/dl (in the first trimester itself), probably she has been

having undetected diabetes prior to conception (pre-gestational diabetes) and could be confirmed by HbA1c estimation. Pregnant women who met WHO criteria for IGT (2hours plasma glucose \geq 140mg/dl) were classified as having gestational diabetes mellitus (GDM).

RESULTS

A total of 480 women underwent both the 100 gm OGTT and a subsequent 75 gm OGTT. Among them, with 100gm OGTT 14(2.9%) women were diagnosed to have GDM and 28 (5.8%) women had IGT. With 75 gm OGTT 33 (6.9%) women were diagnosed as GDM (2 hour PPG \geq 140 mg/dl). The results were statistically analysed by Kappa measure of agreement.

On cross tabulation of 75gm OGTT with 100gm OGTT, of the 14 women positive with 100gm OGTT, 13 (92.8%) were found GDM with 75gm. Of the 447 women negative for GDM with 75gm OGTT 466 (99.8%) were remained negative with 100gm OGTT also (Table 3).

Of the 446 women negative for GDM with 75 gm OGTT, one was positive with 100gm OGTT which is statistically significant. Of the 28 women diagnosed as having IGT three were found to be GDM with 75gm OGTT which is not statistically significant (Table 4 & 5).

Maximum age in this study was 39 years and mini-

Table 3 — Showing Comparison between Prevalence of GDM with 100gm GTT and 75gm GTT

No of cases	75g GTT		Total
	Positive	Negative	
100g GTT Positive	13	1	14
100g GTT Negative	20	446	466
Total	33	447	480

Table 4 — Showing Prevalence of IGT

No of cases	75g GTT		Total
	Positive	Negative	
IGT Positive	3	25	28
IGT Negative	30	422	452
Total	33	447	480

Table 5 — Showing Symmetric Measures

	Value	Approx. Sig.
Measure of Agreement Kappa	0.534	0.000
(a) Not assuming the null hypothesis.		
(b) Using the asymptotic standard error assuming the null hypothesis.		

um age 18 years with a mean age of 24 years. Majority of the women came under the age group of 20-29 years (82.1%).

Table 6 shows the prevalence of obesity. Of the 480 women 366(76.3%) were having normal BMI. Prevalence of obesity was 4.6% and 17.5% were overweight.

Table 6 — Showing Distribution of Cases according to Prevalence of Obesity BMI_CAT

Variables	No of cases (%)
Under weight	8 (1.7%)
Normal	366 (76.3%)
Over weight	84 (17.5%)
Obese	22 (4.6%)
Total	480 (100%)

All of the women were with parity below four. 265 (55.4%) were multigravidae and 168 (35%) were primigravidae. Regarding abortions, 60 women (12.5%) had previous one abortion, 10 women (2.1%) had previous 2 abortions and one (0.2%) had 4 abortions. Of the 480 women, 81 (16.9%) had family history of diabetes.

DISCUSSION

GDM is a clinical entity associated with a significant incidence of diabetes in the later life of the mother. It is also associated with an increase in the foetal, neonatal morbidity and future development of obesity and diabetes in the offspring. Thus GDM offers an important opportunity for the development, testing and implementation of clinical strategies for diabetes prevention. As Indians belonging to a high risk ethnic population, universal screening for GDM is essential.

Out of the 500 women selected for the study, 480 underwent both 100gm OGTT and 75gm OGTT. As per ADA criteria 14 women were diagnosed have GDM with a prevalence of 2.9% and 28 women were diagnosed to have IGT. Of the 14 women 13 were diagnosed have GDM according to WHO criteria also which is statistically significant.

($P < 0.000$) 75 gm OGTT; of the 480 women under study, 33 women were diagnosed to have GDM as per WHO criteria with a prevalence of 6.9%. Seshiah *et al*⁷ found that in their pregnant population the prevalence was 3.93% by applying ADA criteria whereas according to WHO criteria the prevalence was 16.2%. The diagnostic pick up rate was four times more with WHO criteria. In this study the pick up rate with WHO criteria was double that of ADA. More importantly GDM based on 2 hour 75 gm OGTT defined by either WHO or ADA criteria predicts adverse pregnancy outcome. Further assuming that an effective treatment is available, WHO criteria of 2 hour PPG ≥ 140 mg/dl identifying a large number of cases may have a greater potential for prevention which have been confirmed by Meltzer *et al*¹⁹.

CONCLUSION

Thus, the two step procedure of screening 50 gm GCT and then diagnosing GDM based on the cut-off values with 100 gm OGTT is more cumbersome as the pregnant women have to visit the clinic at least twice and the number of blood samples drawn is five. From our study it is found that diagnosis of GDM with 75 gm glucose is more effective and simple. This method recommended by WHO serves both as a screening and diagnostic procedure and is easy to perform besides being economical.

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