Importance of Serial Screening in the Diagnosis of Gestational Diabetes - A Prospective Study

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ABSTRACT

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Objectives: To determine whether:1) repeated screening of pregnant women for gestational diabetes improves detection. 2) lowering the GCT cut off value from 140 mg% to 130mg% increases diagnostic yield. 3) a 2 hr PPBS after 100 gm glucose load yields comparable diagnostic yield to a formal 100 gm 3 hour GTT.

Materials and methods: Pregnant women presenting at the antenatal clinic of SUT hospital were studied. Known pregestational diabetes cases were excluded from the study. Antenatal women underwent a two step diagnostic procedure in each of the three trimesters - initial 50 gm Glucose Challenge screening test (GCT) followed by a 3 hour 100gm oral Glucose tolerance test (GTT) as a diagnostic test in the GCT positive cases. All patients were followed up till delivery and maternal and perinatal outcomes were analysed.

Results: 376 women were screened in the first trimester, 786 in the second trimester and 676 in the third trimester and GDM was detected in 6 (12.76%), 21(44.7%) and 20 (42.55%) respectively. Lowering the cut off value of GCT from 140 mg/dl to 130 mg/dl was found to increase diagnostic yield by 25.1%. Using a single 2 hour cut off value of 140mg/dl after a 100 gm glucose load was found to improve the diagnosis by 31.9% as compared to the 3 hour GTT.

Conclusion: Repeated screening for GDM during the three trimesters helps in identifying more women with GDM . While a lower cut off for the screening test may be advantageous, a single step diagnostic procedure consisting of a 2 hour PPBS of 140mg/dl after a glucose load is more convenient, cost effective and improved the diagnostic yield.

Keywords: Gestational diabetes, Screening, GDM

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INTRODUCTION

Gestational Diabetes Mellitus (GDM) is defined as carbohydrate intolerance with onset or first recognition during pregnancy.[1] It occurs in 3.8 to 21% in different parts of India according to recent studies.[2-3] There is an increased risk of maternal and perinatal complications associated with Gestational diabetes mellitus[4,5,6] and it is accepted that universal screening is essential in Indian women who are at a higher risk of developing GDM and subsequent type 2 diabetes.[7,8,9,12] Traditionally screening for GDM is carried out in the late second or early third trimester. There is great variation in the screening methods and diagnostic criteria used, contributing to the difference in prevalence rates and outcomes. It has been found that increasing glucose intolerance in pregnant women causes graded increase in maternal and perinatal adverse outcomes.[6]

Screening for GDM only once in the late second or early third trimester may result in undetected glucose intolerance earlier in pregnancy leading to adverse outcomes as well as failure to detect later onset glucose intolerance, again compromising outcomes. In a population with higher prevalence of GDM, repeated screening may be necessary to pick up early as well as late onset glucose intolerance.[10,11,12] It yields an opportunity for early dietary and pharmacological intervention , thus improving the pregnancy outcome.

We wanted to find if repeated screening in the three trimesters of pregnancy helped in detecting more cases of GDM and if it improved the pregnancy outcome. We also tried to determine whether lowering the cut off value for the GCT screening test increased the detection rate of GDM.

MATERIALS AND METHODS

Women presenting at the antenatal clinic of our hospital were studied. Known overt diabetes cases and those who booked in the third trimester were excluded

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from the study. Antenatal women underwent a two step diagnostic procedure in each trimester A 50 g Glucose Challenge screening test was done at 11-14 weeks, 22-28 weeks and at 34-36 weeks. A venous plasma glucose cut off value of 130 mg% one hour after glucose ingestion for GCT was used. The GCT positive cases underwent a 3-hour 100gm oral Glucose tolerance test as a diagnostic test .Diagnosis of GDM is made if the plasma glucose level is higher than the following cutoffs in at least two of the four results: fasting level of 95 mg/dl and 1, 2 or 3 h after the oral administration of 100 g of glucose is 180, 155 and 140 mg/dl, respectively .The GCT positive cases who were not diagnosed as GDM underwent further testing in the subsequent trimesters and were reclassified as GDM and non GDM. GDM was managed by dietary modification as the first line followed by pharmacological interventions including metformin and insulin therapy. All patients were followed up till delivery and maternal and perinatal outcomes were analysed.

The statistical analysis was carried out using SPSS 17.0 (SPSS Inc., Chicago, USA)

OBSERVATIONS

Of the 1032 antenatal patients from 01/01/2009 to 31/08/2010, 848 were included in the study and underwent screening. 376 women were screened in the first trimester, 786 in the second trimester and 676 in the third trimester.

The maternal and pregnancy characteristics of the GDM and non-GDM groups are compared in table 1.

Table 1. Maternal and pregnancy characteristics in the outcome groups

Characteristic	Non GDM (n=801)	GDM (n=47)	P value
Maternal age, median (IQR)	27 (27-28)	26 (26-29)	
Maternal weight, median (IQR)	63 (60-65)	63 (58-65)	
BMI, median (IQR)	25.2 (24-26.1)	24.8 (23.3-26.4)	
Parity Nulliparous Parous	409 (51.1%) 392 (48.9%)	20 (42.56%) 27 (57.44%)	0.2569
Family history of DM	104 (12.98%)	28 (59.57%)	<0.0001 *
Previous history of GDM	71 (8.8%)	5 (10.63%)	0.7065

IQR –interquartile range * significant

We found that 28 (59.57%) of the GDM patients had a family history of GDM while 104 (12.98%) of non GDM had a positive family history showing a significant association (P value < 0.0001) .Out of 132 women with a positive family history 27 (20%) had GDM while in those with no family history (716) only 20 had GDM (2.8%) (P value < 0.0001). Diabetes in the father was found in 14 women with GDM (29.8%) compared to 10 women with diabetes in the mother (21.3%). History of GDM in a previous pregnancy was not significantly associated with GDM in the current pregnancy (P value 0.7065).

Table 2 Maternal and Perinatal outcome

Pregnancy Outcome	Non GDM (n=801)		GDM (n=47)		P value
	Number	Percentage	Number	Percentage	
PIH	46	5.7	3	6.4	0.855
IUGR	21	2.6	1	2.1	0.8359
Oligamnios	18	2.2	0	0.0	0.2989
Polyhydramnios	9	1.1	1	2.1	0.5354
Macrosomia (B wt >3.5 kg)	52	6.5	5	10.6	0.2699
Neonatal Hypoglycemia	6	0.7	3	6.4	0.0002 *
Hyperbilirubnemia	6	0.7	1	2.1	0.31
Respiratory distress	3	0.4	1	2.1	0.0882
Preterm delivery	16	1.9	1	2.1	0.9507
Still birth	3	0.4	1	2.1	0.0882

* significant

The maternal and perinatal outcomes in the GDM and non GDM groups are compared in table 2. Maternal complications like PIH, polyhydramnios and macrosomia and neonatal complications such as neonatal hypoglycemia and respiratory distress were more frequent in the GDM group but only neonatal hypoglycemia reached statistical significance

Table 3. Treatment of GDM

TREATMENT	Number	%
Diet	38	69.1
Insulin	13	23.6
Metformin	4	7.3

Table 3 shows the treatment given to GDM women. Most of the GDM patients (38) were treated with diet restriction alone (69.1%). Only 13 women (23.6%) required insulin and 4 women were treated with metformin. All patients had their blood sugar well controlled at the time of delivery.

The first trimester GCT result was above 130mg/dl in 69 women out of which 6 GDM cases were diagnosed.307

women with negative screening underwent repeat screening in the second trimester. Out of the 786 women screened in the second trimester, 183 women were GCT +ve and there were 21 cases of GDM. Similarly in the third trimester, 603 women who had negative screening in the second trimester underwent repeat screening. Out of 676 women screened in the third trimester, 199 were GCT +ve and 20 cases of GDM were diagnosed. A total of 47 GDM cases were diagnosed out of 848 giving a prevalence of 5.5%. Out of the 47 cases of GDM 12.76 % of GDM cases were detected in the first trimester screening 44.7% in the second trimester and 42.55% in the third trimester.

The data was reanalyzed with a GCT cut off value of 140mg% and it yielded a diagnosis of GDM in a total of 35 women only (4.1%), ie, 5 in the first trimester (14.3%), 13 in the second trimester (37.1%) and 17 in the third trimester (48.6%). Thus 12 cases of GDM (25.1%) would have been missed by using a higher cut off value of 140 mg/dl. But the difference did not reach statistical significance (table 4).

Table 4. Comparison of GCT cut off values in diagnosis of GDM

	No. screened	GCT > 130 mg/ dl	GDM	GCT > 140 mg/ dl	GDM	Difference	P value
First Trimester	376	69	6	47	5	1	0.0923
Second Trimester	786	183	21	109	13	8	1.924
Third Trimester	676	199	20	130	17	3	0.2501

When the oral GTT data was reanalyzed using the criteria of plasma glucose more than or equal to 140mg/ dl, 2 hours after an oral glucose load, 62 women could be classified as GDM, giving a prevalence of 7.3%. Although 15 more women were classified as GDM the difference was not statistically significant (table 5and 6)

Table 5. Comparison of diagnosis of GDM using single step and two step procedures

	GDM by two Step Procedure		GDM by single Step Procedure		Difference	P value
First Trimester	6	(12.8%)	11	(17.7%)	5	1.5046
Second Trimester	21	(44.7%)	25	(40.4%)	4	0.3583
Third Trimestter	20	(42.5%)	26	(41.9%)	6	0.8102
Total	47	(100%)	62	(100%)	15	2.206

Table 6. Comparative incidence of Gestational Diabetes with varying levels of GCT and 2hour post glucose values

First trimester		
2 hr value in GTT	GCT1>140	GCT1>130
>140	10	11
>155	5	6
P value		0.9072
Second trimester		
2 hr value in GTT	GCT2>140	GCT2>130
>140	20	25
>155	13	21
P value		0.5795
Third trimester		
2 hr value in GTT	GCT3>140	GCT3>130
>140	27	26
>155	17	20
P value		0.6404
Total		
2 hr value in GTT	Total 130	Total 140
>140	62	57
>155	47	35
P value		0.4657

DISCUSSION

In this study, the prevalence of GDM was 5.5 % which was corresponding to the 3.8 – 21 % quoted in various Indian studies. A study in our institution in 1994-1995 using a second trimester two step procedure had found a prevalence of 15.6%. The fall in prevalence may be partially attributed to early screening and the awareness imparted to the pregnant women regarding proper diet during pregnancy.

The association of risk factors for the development of GDM such as maternal age, BMI and previous history of GDM were not confirmed by the present study whereas family history was significantly associated with the development of GDM.

Lowering the cut off value for GCT from 140mg/dl to 130 mg/dl increased the diagnostic yield by upto 25%. Even though this increases the number of patients undergoing the diagnostic test, this higher diagnostic yield justifies it.

It has been stated that the cut off values for the 2 hour post glucose test remain the same for a 100 gram and 75 gram glucose load. [13] We found that a single step diagnostic procedure using 2 hour plasma glucose value of >140mg/dl after a 100 gm glucose load has a higher diagnostic yield compared to the two

step procedure albeit with a lower cut off. This would be more cost effective and convenient especially when repeated testing in all trimesters is carried out.

Repeated screening appears to be important as 12.76% cases were diagnosed in the first trimester and left undiagnosed would have gone on to develop complications. Similarly without a third trimester test, 42.55% of GDM would have gone undetected.

CONCLUSION

We concluded that irrespective of whether a two step or single step procedure is used, testing in each of the three trimesters is to be recommended.

END NOTE

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