

ROLE OF GLUCOSE CHALLENGE TEST FOR SCREENING OF GESTATIONAL DIABETES

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ABSTRACT

Introduction: Gestational Diabetes Mellitus (GDM) has public health importance far beyond its immediate effect on the mother and child. Pregnancy is a diabetogenic state and GDM is a major driver of the Type 2 diabetes epidemic. About 1% - 3% of all pregnant women will show glucose intolerance. GDM is the most common metabolic complication that affects pregnant women. The frequency of GDM and its associated maternal, prenatal and long term morbidity emphasizes the importance of screening method.

Aim: To study the role of 50 gm glucose challenge test for screening of gestational diabetes

Method: Two hundred and fifty antenatal patients between 24-28 weeks of gestation were screened for gestational diabetes by 50 gm oral glucose challenge test. Those in whom plasma glucose was 130 gm /dl or higher were considered positive and then subjected to Glucose tolerance test (GTT 100 gm: 3 hour). Those with risk factors but negative GCT at 24-28 weeks were again screened at 32 -34 weeks. Comparison was made among normal patients and patients diagnosed with gestational diabetes regarding risk factors, clinical examination, routine and special investigations and pregnancy outcome

Results: Out of 250 patients 150 had no risk factors while 100 had one or more risk factors. 10 patients (4%) were diagnosed as having gestational diabetes. 8 patients were detected at 24-28 weeks and 2 were detected from the risk factor group at 32-34 weeks.

Conclusion: Universal screening of all pregnant patients during 24-28 weeks with glucose challenge test is simple, convenient, cheap and easy to organize instrument to identify women with GDM. In India we recommend universal screening of all pregnant women, as they have 11 fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women.

INTRODUCTION

Pregnancy is a diabetogenic state and results when the beta cells are unable to adapt to the diabetogenic milieu of pregnancy. Diabetes in pregnancy has been the result of serious consequences to the baby as well as the mother if early detection and appropriate treatment is not done. About 1% - 3% of all pregnant women will show glucose intolerance.

In India we recommend universal screening of all pregnant women, as they have 11 fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women¹. The largest number of these patients is comprised of individuals with genetic or metabolic predisposition towards diabetes and who are incapable of compensating adequately for the diabetogenic effects of pregnancy i.e. patients with gestational diabetes mellitus. GDM is the most common metabolic complication that affects pregnant women. The frequency

of GDM and its associated maternal, prenatal and long term morbidity emphasizes the importance of screening method. The pregnant diabetic is confronted with health risks. it can result in acute maternal complications like hypoglycemia, ketoacidosis, pre-eclampsia, uti, polyhydramnios, emotional stress and severe maternal complications like preterm labour, diabetic ketoacidosis, nephropathy and retinopathy^{2,3}. The rationale for using Glucose Challenge Test (GCT) for screening of GDM is based on the physiological changes in normal pregnancy. There is a 10% reduction in maternal fasting glucose levels by the end of first trimester. The diabetogenic stress of pregnancy is encountered during late gestation and is best recognized in fed state.

MATERIALS AND METHODS

The study was done in the antenatal clinic of LLRM Medical College, Meerut. Study was approved by research cell and the ethical committee of the institution. All cases

between 24-28 weeks of gestation were screened for GDM by 50 gm glucose challenge test (GCT). Selection criteria included normal pregnant women patients and high risk pregnancy historical or clinical risk factors like, family history of diabetes in first degree relatives, previous delivery of large infants (birth weight > 4 kg), poor obstetrics history, presence of a congenital anomaly in a previous child such as neural tube defects, cardiac anomalies, etc, obesity, maternal age over 30 years, glycosuria, polyhydramnios, early onset pre-eclampsia. Patients with diagnosed Type I or II diabetes, hepatic disorders, medications like corticosteroids or insulin sensitizing agents, adrenal tumours or Cushing's disease were excluded. Plasma glucose level of 130 mg/dl (7.2 mmol/l) or higher was considered as positive GCT test⁴. If the GCT was negative it was repeated at 32-34 weeks especially in obese, elderly and women with risk of GDM.

3 hour -100 gm oral glucose tolerance test (OGTT) was done on GCT positive patients. GDM was diagnosed when at least two plasma glucose values met or exceeded following values - (NDDG & ACOG Criteria) Fasting - 105 mg / dl (5.9 mmol/L), 1-hour - 190 mg/dl (10.6 mmol /L), 2-hour -165 mg / dl (9.2 mmol /L) , 3-hour -145 mg / dl (8.1 mmol /L) Assay of plasma glucose was performed by glucose oxidase - peroxidase method. Data was compiled using chi-square test and Fisher's exact test with a two tailed P value < 0.05 being considered significant.

RESULTS

Out of 250 patients screened at 24-28 weeks 8 patients (3.2 %) were found having positive oral GCT and OGTT. Of these 8 positive patients, 3 patients belonged to Group I i.e. the control group while 5 patients belonged to Group II having one or more risk factors.

Table 1: Shows the results of screening at 24-28 & 32-34 weeks of gestation

	TOTAL	GROUP I	GROUP II
NO. OF PATIENTS	250	150	100
GCT +VE, OGTT +VE (AT 24-28 WEEKS)	8	3	5
GCT +VE , OGTT +VE (AT 32-34 WEEKS)	2	0	2
GDM +VE PATIENTS	10	3	7

Of the 250 patients screened 10 patients were diagnosed as having gestational diabetes mellitus out of which 7 had one or more risk factors while 3 patients having no risk factors were found to be having gestational diabetes by the above method of screening. These 10 patients were further studied and followed up till the outcome of their pregnancies.

Table 2: Showing the number of patients who were screened with GCT

Period of Gestation	GCT		OGTT	
	Positive	Negative	Positive	Negative
24-28 weeks	50	200	8	42
32-34 weeks	2	-	2	-

Of the 250 patients screened 50 patients had blood sugar values more than or equal to 130 gm/dl by GCT and out of these 8 patients had OGTT positive at 24-28 weeks. Out of the remaining 42 patients who were GCT positive but OGTT negative, those patients having one or more risk factors were screened at 32-34 weeks again and two of these patients had both GCT and OGTT positive at this gestation. Thus from the

above data sensitivity and specificity of GCT came out to be 100 % and 83% respectively (as the number of false positive patients was 42). In the further study comparison was done between normal pregnancies and pregnancy with GDM as regards risk factors, pregnancy outcome and neonatal morbidity. Maximum number of cases of GDM occurred in the age group of > 30 yrs. GDM was seen

to be significantly less common ($P < 0.01$) below 25 yrs of age.

In the normal pregnancy group maximum patients were second gravida (30.62%) whereas in gestational diabetes positive patient group maximum subjects were fourth gravida and grand multigravida (30%) ($P < 0.001$). The incidence of GDM was significantly lower amongst primigravida and second gravida ($P < 0.001$). Maximum number of diabetic pregnancies were above 50 kg weight (90%) whereas in the non-diabetic group maximum patients were between 40-59 kg weight i.e. 63.75 % ($P < 0.001$). In the normal pregnancy group a positive family history was present in 10.42 % but in GDM group it was 20% - the difference being highly significant ($P < 0.001$). In the normal pregnancy group the incidence of preeclamptic toxemia, polyhydramnios, urinary tract infections, vaginal infections (candidiasis) was 10.63%, 2.08%, 6.67% and 7.9% respectively, while in the gestational diabetes group these were 20%, 10%, 20% and 30% respectively - the difference between all being highly significant ($P < 0.001$). One case (10%) out of the 10 diabetic patients was controlled by dietary modifications alone while in nine patients (90%) human insulin had to be added, the dose varying with the degree of hyperglycaemia.

Preterm labour was observed in 25 patients out of which 23 belong to normal pregnancy group and 2 to GDM group thus constituting an incidence of 9.5% and 20% respectively which was highly significant ($P < 0.001$). In the normal pregnancy group the caesarean section rate was 32.5 % as compared to 80% in the group with gestational diabetes. The difference was highly significant ($P < 0.001$). Out of total 86 cases of caesarean section 3 were performed before 37 completed weeks of gestation the cause being pre-eclampsia, malpresentation and fetal macrosomia. Vaginal delivery occurred in 162 patients (67.08%) of control group as compared to only 2 patients (20%) of gestational diabetes group. This difference was highly significant.

In the normal pregnancy group the incidence of macrosomia was 3.33% as compared to 20% in the pregnancy group with gestational diabetes. This difference

was highly significant ($P < 0.001$). One infant (5%) in the diabetic group had major congenital malformation in the form of cardiac anomaly (ASD) and it was premature. A higher incidence of hypoglycaemia (30%) was found amongst the 3 infants of gestational diabetic mothers and 1 out of these 3 infants was premature.

In the normal pregnancy group hyperbilirubinaemia was present in 3 infants (1.25%) of infants, whereas in the infants born to gestational diabetics it was present in 2 infants (20%), the incidence being significantly ($P < 0.01$) high. In the pregnancy group with gestational diabetes two of the infants had RDS (20%) and one of these was born before 37 weeks of gestation. The incidence of RDS in the normal pregnancy group was 3.75 %, (9 infants) of which 7 infants were premature.

The difference in the incidence of RDS in the infants born to normal mothers and gestational diabetics was significant ($P < 0.01$). Twice weekly nonstress test backed up by foetal biophysical profile were employed for antepartum foetal surveillance of the cases of GDM, in patients with foetal biophysical profile score of 10 there was no perinatal mortality. The perinatal mortality in the normal pregnancy group was 6.67 % but in the gestational diabetic group it was 10%. Prematurity was an associated factor in a most half the cases. The difference between the two groups was significant ($P < 0.05$).

DISCUSSION

Pregnancy is a diabetogenic state and GDM has public health importance far beyond its immediate effects on the mother and child. Prevalence of GDM is high in India and diabetes in pregnancy is associated with serious consequences to the baby as well as the mother if early detection and appropriate treatment are not offered. In India, screening is essential universally in all women diagnosed to be pregnant as they have an 11 fold increased risk of developing glucose intolerance during pregnancy compared to Caucasian women. The usual recommendation for screening is between 24 and 28 weeks of gestation.

In this study only 10 patients were found to have gestational diabetes, out of 250 patients enrolled for the study 150 patients did not have any risk factors and were put together in group 1 or control group while 100 patients having one or more risk factors were put in group 2, it was found that gestational diabetes was significantly associated with age group above 30 years and even more significantly with age above 35 years and was less common below 25 years of age⁵ which was similar to Abell (1976) who stated that age above 35 years was associated with an increased detection rate of gestational diabetes. Maximum incidence (30%) of gestational diabetes was amongst multigravida which was significantly higher statistically than the normal pregnancy group and lower among the primary and second gravida. Our study showed that most of the patients having GDM were above 50kg weight which was in accordance with study of Norlander et al (1989) who also reported obesity to be significantly ($p < 0.001$) associated with gestational diabetes.

The incidence of preeclamptic toxemia, polyhydramnios, urinary tract infections, vaginal infections (candidiasis) was seen to be more in gestational diabetes as compared to normal pregnancy and the difference was found to be significant⁶, Abdulbari bener et al⁷ in 2011 in Qatar studied the outcome of pregnancy complicated by GDM and concluded that there was increased risk of developing maternal and neonatal complications in pregnant females with GDM.

The rate of caesarean section was found to be significantly higher in GDM group as compared to normal pregnancy which was in accordance to the Toronto tri-hospital study which identified GDM pregnancy having a two-fold increased risk of cesarean delivery⁸ A higher incidence of

cardiac anomalies, prematurity and hypoglycemia and hyperbilirubinaemia were found in infants of GDM mothers which was similar to the study of Hay WW JR who also found that despite advances in perinatal care, infants of diabetic mothers remain at risk for a multitude of physiologic, metabolic, and congenital complications such as preterm birth, macrosomia, asphyxia, respiratory distress, hypoglycemia, hypocalcemia, hyperbilirubinemia, polycythemia and hyperviscosity, hypertrophic cardiomyopathy, and congenital anomalies, particularly of the central nervous system⁹. Perinatal mortality was also found to be higher in infants of gestational diabetic group¹⁰ which was similar to study of Angadi Rajasab Nilofer et al who also concluded that a higher risk of perinatal outcome is present in women with GDM and effective screening could help in preventing future diabetes mellitus in the mother and also in the unborn child.

CONCLUSION

Gestational diabetes has many maternal and foetal complications so it is necessary to detect gestational diabetes. Screening of all pregnant patients during 24-28 weeks with glucose challenge test is simple, convenient, cheap and easy to organize at outpatient setting.

Thus we may conclude that universal screening remains a good instrument to identify women with GDM at least in populations like our Indian population where there is high prevalence of diabetes and a large percentage of women are at medium or high risk for GDM. Thereby screening, proper management and follow up of women with GDM and their offspring has the potential to prevent diabetes in two generations.

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