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Original Research Article

The application of 50g oral glucose challenge test in screening for gestational diabetes mellitus in patients attending antenatal care OPD

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ABSTRACT

Background: To screen patients at average risk for Gestational Diabetes using 50g Glucose Challenge test, to ascertain the prevalence of Gestational diabetes through further diagnostic testing and to prevent and manage complications. Gestational diabetes mellitus (GDM) is defined as carbohydrate intolerance of variable severity with onset or first recognition during pregnancy. Women with GDM are at risk for maternal and foetal complications, so it is important to screen all the pregnant woman.
Methods: This study was conducted in 198 patients between 24 and 28 weeks of gestation, attending the Antenatal clinic. 50g oral glucose is administered irrespective of time of the last meal and plasma glucose is measured one hour later. Patients with plasma glucose levels more than 140 mg/dl were subjected to a 100g oral glucose tolerance test, patients with two or more abnormal reading were labelled as GDM and managed accordingly.
Results: Prevalence of GDM in our study was 9.59%. Maternal complications like gestational hypertension, vaginal infections and foetal complications were much higher in GDM patients as compare to non GDM group.
Conclusions: GDM is a disease which adversely affects both mother as well as foetus. It is concluded that 50 gm glucose challenge test at 24-28 weeks of gestation with a cut-off value of 140 mg/dl is a reliable screening test for GDM. This test offers the best combination of ease and economy of use and reproducibility in screening for gestational diabetes mellitus in average risk patients.

Keywords: Gestational diabetes mellitus, Glucose challenge test, Oral glucose tolerance test

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as glucose intolerance of variable severity with onset or first time diagnosed during pregnancy. These patients may develop type 2 diabetes later in life. GDM affects 1.2-14.3% of pregnant population.[1,2] Prevalence rates of GDM varies worldwide and even with in a country's population and depends on ethnicity.[3,4] The prevalence rates of GDM are highest among Asians.[4,5]

The prevalence of diabetes mellitus is increasing in developing countries. This increasing trend is because of urbanisation, reduced physical activity, changes in dietary patterns and obesity.[6]

Carbohydrate intolerance during pregnancy causes significant increases in maternal and foetal morbidity and mortality. These women have a greater incidence of preeclampsia, Vaginal infections, postpartum haemorrhage, increasing chances of operative deliveries and puerperal sepsis.[7,8] Foetal complications in women with poor glycaemic control are macrosomia, shoulder dystocia, birth trauma, congenital anomalies and neonatal complications.[9] In cases of GDM there will be maternal hyperglycaemia and excess placental glucose transfer, this results hyperinsulinaemia in foetus. The high insulin levels in the foetus stimulate growth especially adipose tissues and leads to foetal macrosomia (birth weight over 4000 g).[10]

The American college of obstetrician and Gynaecology (ACOG) and the American Diabetes Association (ADA) have recommended that screening of all pregnant women should be done for GDM.[11,12] So diagnosis and management of GDM can prevent major maternal and parental complications associated with it.

Hence this study was carried out to detect glucose intolerance that occur during pregnancy. In our institute, we were using fasting and postprandial sugars for screening.

However, there are women who have normal fasting and postprandial levels which show exaggerated response to glucose challenge. Milder forms of the disease may be therefore missed if testing is done without administering a glucose load, which helps borderline glucose intolerance to become overt.

METHODS

This study was conducted between January 2013 and December 2013 on patients attending the antenatal Clinic at ESI-PGIMSR MGM Hospital Mumbai. All patients between 24 and 28 weeks of gestation attending the antenatal clinic and Consenting to take part in the study were included. While all patients with known cases of Diabetes Mellitus, BMI >40, previous history of Gestational Diabetes, Impaired Glucose Metabolism or Glycosuria and patients taking steroid therapy for any disorder, were excluded.

A total of 198 patients were screened for GDM, a detailed questionnaire was used to take details regarding family history, medical and obstetric history. Body mass index (BMI), blood pressure, any evidence of vaginal infection and other parameters were recorded.

This test was done as OPD procedure. 50g oral glucose load is administered during the visit irrespective of time of the last meal and plasma glucose is measured one hour later. Patients with plasma glucose levels more than 140 mg/dl were subjected to a diagnostic 100g Oral Glucose Tolerance Test as recommend by ACOG and ADA to confirm GDM. Patients with plasma glucose label ≥200 mg/dl were not subjected to 100 gm OGTT and were considered to be as GDM. The sugar values were analysed by Carpenter and Coustan Criteria (C and C criteria). The patients with two or more abnormal plasma glucose values according to C and C criteria (fasting ≥95, 1h ≥180, 2h ≥155, and 3h ≥140 mg/dl) were labelled as GDM.

Patients with GDM were advised about diet and if required were given insulin therapy. All 198 patients were followed till delivery and all the events were recorded.

Statistical analysis

Results were analysed by Chi-square (x2) test. Results were given as numbers and percentages (%) with 95% Confidence interval. A value of p <0.05 was considered statistically significant unless otherwise specified.

RESULTS

A total 198 patients were screened for GDM by GCT at 24-28 weeks of gestation. Out of 198 patients, 51 patients had positive GCT and these patients were then subjected to 100 gm OGTT. Out of 51 patients, 19 (9.59%) were diagnosed as GDM. Remaining 179 formed non GDM group.

Mean age of GDM patients was 27.95±4.05years and mean BMI was 24.32±2.96.

Table 1 shows the comparison of prevalence of risk factors in two groups. Age ≥25 years, BMI ≥25 Kg/m2 and family history of diabetes mellitus were significantly associated with GDM group (p <0.05) than non GDM group.

Table 1: Prevalence of risk factors in GDM and non GDM group.

Risk factors	Non GDM n = 179	GDM n=19	p value
Age ≥25 years	89 (49.72%)	14(73.68%)	0.046
History of DM in family	11(6.14%)	7(36.84%)	0.00001
Parintal loss in previous pregnancies	13(7.26%)	3(15.79%)	0.194
History of big baby	1(0.56%)	2(10.53%)	0.0005
BMI ≥ 25 Kg/ m^2	46(25.69%)	11(57.89%)	0.016

DM: Diabetes mellitus, GDM: Gestational diabetes mellitus, BMI: Body mass index.

Table 2 shows associated complications like gestational hypertension, vaginal infections, premature rupture of membrane and delivery outcomes.

The Prevalence of all these complications was significantly higher in GDM group. The cesearean rate, instrumental delivery and shoulder dystocia were significantly higher in GDM group. Although percent prevalence of Post-partum haemorrhage was higher in GDM group but it was not statistically significant.

Table 3 shows neonatal outcome. The prevalence of intrauterine foetal death (IUFD), NICU admission, macrosomia was statistically significant in GDM group. The prevalence of hyperbillirubinemia was higher in GDM group but not of statistical significance.

Table 2: Prevalence of associated complications and delivery outcome among GDM and non GDM patients.

	Non GDM n = 179	GDM n=19	p value
Gestational hypertension	25(13.96%)	6(13.57%)	0.04
PROM	11(6.15)	3(15.78%)	0.118
Vaginal infections	11(6.15)	5(26.31%)	0.002
Abruptio placentae	3(1.67%)	1(5.26%)	0.290
LSCS	46(25.69%)	10(52.63%)	0.013
FTND	130(72.62%)	7(36.84%)	0.0013
Instrumental vaginal delivery	3(1.67%)	2(10.53%)	0.019
Shoulder dystocia	0	1(5.26%)	0.002
PPH	9(5.03%)	3(15.78%)	0.061

PROM: Premature rupture of membrane, LSCS: Lower segment caesarean section, FTND: Full term normal delivery, PPH: Post-partum haemorrhage

Table 3: Neonatal outcome.

	Non GDM n = 179	GDM n=19	p value
Still birth	1(0.56%)	1(5.26%)	0.051
NICU admission	8(4.47%)	4(21.05%)	0.0039
Macrosomia	2(1.12%)	3(15.79%)	0.00010
Hyperbillirubin-emia	19(10.61%)	3(15.79%)	0.49

NICU: Neonatal intensive care unit

In our studies out of 19 patients, 14 were (73.68%) managed by dietary modification and 5 (26.315%) patients required insulin along with diabetic diet.

DISCUSSION

The prevalence of GDM is reported between1.2% to 14.3 %.[1,2] The prevalence of diabetes mellitus is increasing in developing countries. This increasing trend is because of urbanisation, reduced physical activity, changes in dietary patterns and obesity.[6] Prevalence rates of GDM varies worldwide and even with in a country's population and depends on ethnicity.[3,4] Asians have higher prevalence rates as compared to Europeans.[4,5]

The present study is prospective hospital-based study, showed the prevalence of GDM as 9.59%.A similar study was conducted in Karnataka and found a prevalence rate of 6%.[13] Wahi et al, from Jammu found a prevalence of GDM 6.94% in their study.[14] A random survey was done in different cities of India in 2002-2003, the prevalence of GDM in Chennai was 16.2%, in Thiruvananthapurum 15%, in Alwaye 21%, in Banglore 12%, 18.8% in Erode and 17.5 % in Ludhiana.[15] A similar study was done in Tamil Nadu in urban, semi urrban and rural areas and the prevalence of GDM was 17.8%, 13.8% and 9.9% respecteviely.[16]

Compared with non-GDM subjects, GDM patients were older, with the mean ages of the two groups being 22.65±3.99 years and 27.95±4.05 years, respectively. A study from South India showed age >25 years as a risk factor for developing GDM.[16] Obesity is an important risk factor associated with development of GDM. Study conducted by Das et al. found that 25% patients were obese and Gomez et al. found obesity in 50% of women with GDM.[17,18] This may be due to increased demands on maternal metabolism during pregnancy from excess weight, resulting in imbalances in hormonal carbohydrate regulation mechanisms, and insulin sensitivity. In our study, a significant no. of patients (57.89%) with GDM were having BMI ≥25.

Family history of diabetes mellitus was found in 36.84% of our GDM women.

Our study shows that 15.78% of GDM mothers had history of parintal loss. In the study conducted by Wahi et al. Showed that 24.9% of their GDM patients had a history of parintal losses.[14] Insulin being a potent growth factor promotes lipogenesis, protein synthesis, and therefore growth of the foetus.[10] Hence, history of prior delivery of a big baby or a macrosomic baby (birth weight >4 kg) is also indicative of existence of GDM in previous pregnancies which may have not been diagnosed. In our study, 10.56% of GDM women gave previous history of delivery of big babies.

Our study revealed that the most common complications seen in GDM mothers were gestational hypertension (31.57%) followed by vaginal infections (26.31), premature rupture of membranes (15.78), and abruption placentae (5.26%). Gajjar et al, in his study found that most common maternal complication seen in GDM mothers was gestational hypertension (36.4%) followed by abruption placentae (20%).[19] In HAPO study, 5.9% of GDM patients had Gestational Hypertension and 4.8% had preeclampsia.[20]

The HAPO study found a direct correlation between GDM group and LSCS rate which was 23.7%.[20] In our study LSCS rate was 52.63% in GDM group.

In our study 15.78% of new born were macrosomics in GDM group as compare to 2.23% in non GDM group. In the study conducted by Hong et al., 6.5% of GDM patients had big baby.[21]

In our study, still birth rate was 5.26% in GDM group. In a study conducted by Odar et al. in Uganda, a stillbirth rate of 16.7% was found.[22]

CONCLUSION

Our study has shown the increased prevalence of GDM and all GDM patients had normal fasting and postprandial sugar levels which was done as routine anti-natal investigation but showed exaggerated response to glucose challenge. Hence Milder forms of the disease may be therefore missed if testing is done without administering a glucose load, which helps borderline glucose intolerance to become overt. So, it is concluded 50 gm glucose challenge test (GST) at 24-28 weeks of gestation with a cut-off value of 140 mg/dl is a reliable screening test for gestational diabetes mellitus in the population studied. This test offers the best combination of ease and economy of use and reproducibility in screening for gestational diabetes mellitus in average risk patients.

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