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Research Article

Screening of Gestational Diabetes Mellitus with 75gm OGTT and its effects on Feto-maternal Outcome

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Abstract: Our study was designed to find out the incidence of Gestational Diabetes Mellitus by using 75 gm oral glucose tolerance test as a single step procedure to both screen and diagnose and to know the effects of gestational diabetes towards maternal and fetal outcome. 500 pregnant women with singleton pregnancy were screened with 75 gm oral glucose tolerance test. Those with 2 hour venous plasma glucose of ≥ 140mg/dl were diagnosed as gestational diabetes and were put under medical nutrition therapy or insulin. All the cases were followed up till delivery for fetal and maternal outcome. The overall incidence of gestational diabetes mellitus was 5.2%. It was more common in obese patients, with family history of diabetes and in multigravidas. Maternal complications like vaginal candidiasis, hypertension, polyhydramnios, and preterm labour were more common in diabetic group. Fetal outcomes like macrosomia, shoulder dystocia, still birth, hypoglycemia, congenital anomalies, trauma during delivery were all found to be more in patients with gestational diabetes. The rise in prevalence of Gestational Diabetes in our community and its associated increased risk of pregnancy and delivery complications justifies a need to screen pregnant mothers who attend the antenatal clinic. This single step procedure (75gm OGTT) is a simple economic and feasible method. It serves both for the purpose of screening and diagnosis at the same time.
Keywords: OGTT-Oral glucose tolerance test, GDM-Gestational diabetes mellitus, ADA-American Diabetes Association.

INTRODUCTION

Gestational diabetes mellitus is defined as carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy. The definition applies whether or not insulin is used for treatment or the condition persists after pregnancy. It does not exclude the possibility that the glucose intolerance may have antedated the pregnancy [1-2]. Although the prevalence of GDM is usually reported as 2 to 5 % in pregnant women, it can be as high as 14% depending on the population described and the criteria used for diagnosis [3]. The prevalence in women with defined high risk factors such as being older than 25 years, being obese or having a family history of diabetes ranges from 3.3% to 6.1% [4]. They are at risk of development of type-2 diabetes in approximately 50% of cases in later life [5]. Studies have shown that there is a much higher rate of maternal and fetal compromise in diabetic pregnancies as compared with normal pregnancies [6]. Diabetic mothers are exposed to an increased risk of hypertension in late pregnancy [7]. Other obstetric complications such as polyhydramnios, preterm labour and abortions are also commonly encountered in pregnant diabetics. Infants of diabetic mothers are exposed to variety of problems such as, sudden intrauterine death, respiratory distress syndrome, hypoglycemia, cardiomyopathy, neonatal jaundice, impaired calcium and magnesium homeostasis and many more.

Rationale of GDM screening include

- It allows identification GDM and hence treatment disposition thereby reducing the associated maternal and neonatal risk.
- It also allows identification of a group of women who have an increased risk of developing diabetes mellitus later in life.

The screening procedure should be simple, safe, precise and validated. It should also be acceptable to the population with well defined cut of levels.

DIPSI (Diabetes In Pregnancy Study Group India) recommends “A one step procedure with a single

glycemic value", to diagnose GDM in the community: It recommends 75g OGTT irrespective of fasting status and GDM is diagnosed if 2-hour plasma glucose is ≥ 140 mg/ dl. This test correctly identifies subjects with GDM, as well as woman with normal glucose tolerance [8].

Categorizing abnormal glucose tolerance in pregnancy (75gm OGTT)

2 hr plasma Glucose	In Pregnancy	Outside Pregnancy
> 200 mg/ dl	Diabetes	Diabetes
> 140 - 199 mg/ dl	Gestational Diabetes Mellitus (GDM)	Impaired Glucose Tolerance(IGT)
120- 139 mg/ dl*	Gestational Glucose Intolerance (GGI)	--
< 120 mg/ dl	Normal	Normal

* Needs follow up

Our study was designed to find out the incidence of carbohydrate intolerance in the form of GDM by using 75 g oral glucose tolerance test as a single step procedure to both screen and diagnose gestational diabetes mellitus and to know the effects of hyperglycemia (GDM) towards maternal and fetal outcome.

MATERIALS AND METHODS

This was a prospective cohort study conducted from September 2008 to Jan 2011 in the Dept. of Obstetrics & Gynecology, SCB Medical College, Cuttack. 500 pregnant women with singleton pregnancy who had come for antenatal check up were interviewed using partially coded questionnaires with both open and close ended questions regarding their family history, previous health status & obstetric outcome. Each mother at 24-28 weeks of gestation was given 75 gm glucose dissolved in a glass of 200 ml water to drink and after two hours venous blood was collected. This was analysed in auto analyser in our central laboratory using GOD-POD method. The WHO criteria for diagnosis of gestational diabetes using two hour plasma glucose value of 140mg/dl or more was used as the cut off value to diagnose GDM. Those mothers having blood glucose values more than 140 mg/dl were marked as having GDM and the rest with blood glucose values less than 140mg/dl were marked as non diabetic controls. The mothers having GDM were offered treatment. GDM patients with 2 hr blood glucose less than 200mg/dl were given dietary advice in the form of medical nutrition therapy(MNT) initially for two weeks .The cases in which MNT fails to achieve control i.e. to maintain FPG =90mg/dl and/or 1 ½ hr PPG =120 mg/dl ,insulin was initiated . Those with a 2-hr blood glucose >200mg/dl were started on insulin after confirmation of the results with diabetic physicians .The mothers who had some high risk factors in their history were called for rescreening between 34-36 weeks of gestation. The same protocol was followed as during the initial screening procedure. All screen positive mothers were followed up and encouraged to deliver in our hospital. Sociodemographic characteristics, pregnancy complications like hypertension, candidiasis, fever, polyhydramnios, intrauterine fetal death, modes and complications of delivery, birth weight , Apgar score, still birth, or preterm labour, antepartum hemorrhage and congenital abnormality in the babies were recorded. They were asked to come back to postnatal clinic where they were reviewed and those who had gestational diabetes were again required to undergo a 75 g oral glucose tolerance test.

RESULTS

Out of 500 patients at 24-28 weeks of gestation screened with 75 g oral glucose tolerance test, 20 patients exhibited plasma glucose level ≥ 140 mg/dl and were diagnosed to have Gestational Diabetes Mellitus (GDM). Total number of patients who presented for re-screening at 32-36weeks were 300 out of whom 6 patients were again screen positive after undergoing a 2-hr 75 g OGTT. The overall incidence of GDM was 26 per 500 cases (5.2%) (Table 1).

Table 1: Incidence of GDM

	Total cases	GDM	Percentage
Cases picked up after initial screening	500	20	4%
Cases picked up after re-screening	300	6	2%
Total	500	26	5.2%

Highest numbers of GDM were observed in the 26 to 30 year age group i.e. 10 cases out of 26 diagnosed cases of GDM (Table-2).

Table 2: Patients Characteristics (Age)

Age in years	GDM	Controls
< 20	Nil (0%)	8(1.68%)
20-25	5 (3.70%)	130(27.42%)
26-30	10 (6.41%)	146(30.80%)
31-35	8 (5.79%)	130(27.42%)
>35	3 (4.76%)	60(12.65%)

Incidence of GDM is high among multigravid women (G3+G4+G5 =69.23%) as compared to primigravida/G2 which is 30.79% (Table 3).

Table 3: Patients Characteristics (Parity)

Parity	GDM	Controls
0	1(3.8%)	80(16.8%)
1	7(26.92%)	178(37.55%)
2	7(26.92%)	150(31.64%)
3	8(30.76%)	47(9.91%)
Grand multipara	3(11.53%)	19(8.43%)

Table 4: Patients Characteristics (Obesity)

BMI(kg/m^2)	GDM	Control
<30	7(26.92%)	332(70.05%)
>30	19(73.08%)	142(29.95%)

26.9% of GDM cases had BMI< 30 kg/m^2 as compared to 70.05% controls and 73.08% GDM cases had a BMI >30kg/ m^2 as compared to 29.95% of controls which was significant(Table-4). This indicates that BMI>30 kg/m^2 is a significant risk factor in the occurrence of GDM. GDM is more common among uneducated and patients with primary education as compared to women having higher education which was statistically not significant (Table-5). Positive family history of Diabetes in GDM is 61.53% as compared to 9.91% in controls. Thus family history is a major factor in the occurrence of GDM and is statistically significant (Table 6).

Various complications encountered during pregnancy in patients diagnosed to have GDM. Vaginal candidiasis was found to be 18 times more likely & hypertension 11 times more likely in women with GDM. Polyhydramnios was 20 times more likely in GDM patients and preterm labour was 6 times more likely in GDM. There were no documented cases of abortion and APH in GDM cases (Table 7).There were increased incidence of operative vaginal delivery and caesarean section in patients with GDM, which were statistically significant (Table 8).

Table 5: Patients Characteristics (Education)

Education	GDM	Controls
Uneducated	11(42.30%)	147(31.01%)
Primary	8(30.76%)	138(29.11%)
Higher	7(26.92%)	189(39.87%)

Table-6: Family History

Family history of Diabetes	GDM	Control
Yes	16(61.53%)	47(9.91%)
No	10(38.47)	427(90.09%)

Table 7: Maternal Complications in GDM

Complications	GDM	Controls	R.R	95% C.I
Vaginal candidiasis	6(23.07%)	2(0.42%)	18.45	10.26-33.17
Hypertension	5(19.23%)	5((1.05%)	11.67	5.52-24.64
Polyhydramnios	2(7.69%)	0	20.75	14.04-30.65
Preterm labour	1(3.84%)	2(0.42%)	6.62	1.27-34.34
Abortions	0	1(0.21%)	-	-
APH	0	2(0.42%)	-	-

Table 8: Modes of Delivery in GDM

Modes of delivery	GDM	Controls	R.R	95% C.I
Normal vaginal delivery	4(15.38%)	314(66.24%)	0.10	0.03-0.31
Operative vaginal Delivery	10(38.46%)	40(8.45%)	5.62	2.69-11.72
Caesarean section	12(46.16%)	120(25.32%)	2.39	1.13-5.03

Table 9: **Fetal Outcome in GDM**

Outcome	GDM	Controls	R.R	95% C.I
Normal babies	11(42.30%)	458(96.62%)	0.04	0.02-0.09
Macrosomia	5(19.23%)	5(1.05%)	11.67	5.52-24.60
Still birth	1(3.84%)	1(0.21%)	9.96	2.36-41.93
Shoulder Dystocia	2(7.69%)	1(0.21%)	13.80	5.66-33.62
Hypoglycemia	1(3.84%)	1(0.21%)	9.96	2.36-41.93
Trauma	1(3.84%)	1(0.21%)	9.96	2.36-41.93
Cong.Anomaly	2(7.69%)	1(0.21%)	13.80	5.66-33.62
Hylaine membrane disease	1(3.84%)	1(0.21%)	9.96	2.36-41.93
Jaundice requiring phototherapy	2(7.69%)	2(0.42%)	10.33	3.59-29.67
Early neonatal death	0	12(2.53%)	-	-

Fetal outcomes like macrosomia, shoulder dystocia , still birth, hypoglycemia, congenital anomalies and trauma during delivery were all found to be more in patients with GDM than in controls which were statistically significant (Table 9). All the GDM patients were followed up for postpartum(6weeks) glucose tolerance test with 75 gm glucose. None of them came positive.

DISCUSSION

Pregnancy is a diabetogenic state manifested by insulin resistance and hyperglycemia and is implicated to be associated with significant obstetric complications. Diabetes complicates 3-4% pregnancies according to various researchers in America, Europe and Asia. Gestational diabetes has a rising trend in the recent times and depending on the type of population, it is said to complicate 1 – 16% of all pregnancies [9]. In our study 26 out of 500 mothers were diagnosed as GDM the prevalence being 5.2% in our hospital.

A single test procedure by single step 75 gm OGTT was used in this study to screen and diagnose the cases of GDM. This test procedure is done in the non-fasting state which is justified as a patient of GDM has an underlying defect in secretion of insulin consequently her glycemic level increases with a meal and with glucose challenge this glycemic excursion exaggerates further. The second important reason for recommending this procedure is because the specificity of the ADA screening test with 50 g 1 – hr GCT without regard to time of last meal is low. It is thus preferable to perform this single step procedure as compared to 50gm-1 hr test and then 100 gm OGTT. This single step procedure serves both as screening and diagnostic test for GDM, is simple, economical and feasible [10]. Similar studies in Sri Lanka have demonstrated that fasting plasma glucose is unsuitable for screening. The 2 hr 75 g blood glucose at a threshold more than 140 mg/dl is sensitive and specific [11]. This single step procedure is more acceptable, less expensive and less invasive.

In our study , 73% of patients of GDM had a BMI > 30kg/m^2, which is in accordance with the Fourth International Workshop expert Committee conclusion that BMI>27 kg/ m2 is a high risk factor for occurrence of GDM. Family history was found to be a significant risk factor in causation of gestational diabetes as reported in many other studies [12].

There have been significant advances in the quality of care imparted to diabetic mothers which subsequently led to a dramatic fall in perinatal deaths attributed to diabetic problem. However adverse maternal and neonatal outcomes are still associated with the pregnant diabetic woman. Gestational diabetes still remains fraught with risks for the mother through the greater predisposition towards hypertensive disorders of pregnancy and preeclampsia, and is further more associated with a greater morbidity brought on by obstetric interventions.

Preterm labour as an outcome of diabetic pregnancies was significant i.e 6 times more common in GDM than non diabetic groups. Several studies have found out that the frequency of preterm labour is up to 20% higher in GDM pregnancies [13]. Polyhydramnios and increased susceptibility to infection in poorly controlled diabetes may be the contributory factors.

Congenital anomalies in GDM was found to be 7.69% and in non GDM control subjects it's incidence was around 0.21%. Different researchers have reported that approximately 3 to 8% of infants of diabetic mothers suffer from major congenital malformations

[14-15]. Macrosomia complicates 19.23% of GDM pregnancies which was comparable with other studies [16]. Still birth was 9 times more common among GDM pregnancies as compared to non diabetic controls suggesting that factors other than placental insufficiency are involved in the etiopathogenesis.

The rise in prevalence of Gestational Diabetes in our community and its associated increased risk of pregnancy and delivery complications justifies a need to screen pregnant mothers who attend the antenatal clinic. Our results suggest that a policy of universal screening for GDM should be adopted in all antenatal clinics and 75 gm OGTT has a high predictive value .This single step procedure is a simple economic and feasible method. It serves both for the purpose of screening and diagnosis at the same time. So looking towards the sociodemographic characteristics of our patients it should be followed in our region to achieve a better outcome .As in this study significant number of patients were detected in on repeat OGTT , it is emphasized that rescreening at a later gestation age of 32 weeks or later must form an essential component of screening. It will not only improve the perinatal outcome but also enable us to identify women at risk of developing diabetes in the future. The postpartum screening should be at regular interval to detect the recurrence of future diabetes. These potential diabetic women can be warned of the future happening and advised to adopt preventive measures to halt or delay that process. This will in turn shed load from health care resources responsible to take care of the diabetic patients in the long run. Regarding management, it should be individualized and MNT should be the first line of choice over insulin initially. Considering socio-demographic differences and indoor treatment might be more beneficial.

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