Fetomaternal outcome in elevated Glucose Challenge Test and gestational diabetes

Shrestha A[1], Kayastha B[1], Pradhan N[1]
[1]Department of Obstetrics and Gynecology, Dhulikhel Hospital - Kathmandu University Hospital, Kavre

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Aims: To observe the maternal and fetal outcome among those having elevated Glucose Challenge Test (GCT) level and gestational diabetes mellitus (GDM).

Methods: Medical record of 15,413 pregnant women booked and delivered between June 2012 and January 2018 were evaluated. GCT was performed by using 50gm glucose and diagnosis of gestational diabetes performed by using the Carpenter Coustan Criteria. Pregnancy outcomes were assessed by the antenatal events, gestation and mode of delivery. Similarly, neonatal outcomes assessed in terms of birth weights, Apgar score, congenital abnormalities, hyperbilirubinaemia, hypoglycaemia and respiratory distress syndrome.

Results: The detected incidence of gestational diabetes was 2.35%. With the threshold plasma glucose level at 140 mg/ dl, 1843 women needed to undergo 100g oral glucose tolerance test and 363 women had gestational diabetes.

Conclusions: It is very important to find out GDM in pregnancy as it has adverse outcomes which are preventable; it is worthwhile to detect GDM by screening in pregnancy. The 50g GCT is feasible and 100gm OGTT to find out GDM.

Keywords: fetomaternal outcome, gestational diabetes, glucose challenge test, oral glucose tolerance test, pregnancy

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INTRODUCTION

Gestational diabetes (GDM) is defined as glucose intolerance of variable severity with onset or first recognition during the present pregnancy and reverting to normal after the puerperium.[1] The frequency of gestational diabetes mellitus is 0.6% -15% of pregnant woman.[2] Figures vary considerably depending upon the criteria used and demographic characteristics of the population. The prevalence is expected to increase as the epidemic of obesity continues.[3] Whereas the study performed in Singapore showed the incidence ranges from 1.1% to 13.3% of the population. Pregnancies affected by GDM impose a risk for both mother and child as the risk of cesarean and operative vaginal delivery, macrosomia, shoulder dystocia, neonatal hypoglycemia and hyperbilirubinemia is increased.[4] Women with a history of GDM are also at an increased risk of developing type 2 diabetes mellitus (T2DM) in the years following their pregnancy and their children have a higher risk of developing obesity and T2DM early in life.[5-7] For those reasons it is important to pay rigorous attention to GDM and the purpose of this study is therefore to cover a wide range of clinical issues related to GDM its treatment and prevention and the long and short term consequences of GDM for both mother and child.

CORRESPONDENCE

Dr Abha Shrestha
Associate Professor, Department of Obstetrics and Gynecology, KU
Email:abhaobgy@gmail.com
Mobile: +977-9849230060

METHODS

It was a retrospective, study carried out in all the pregnant women attending Kathmandu University School of Medicine between January 2012 to January 2018 after the IRC approval. There were total 15,413 pregnant women who were booked as our antenatal cases having no previous history of diabetes mellitus.

These patients underwent the 50g GCT between 24 and 28 weeks of gestation or at booking visit if they come after 28 weeks of gestation. A 50g glucose drink was administered after the antenatal consultation and 60 minutes later venous blood was drawn for plasma glucose estimation. The glucose oxidase method was performed to estimate the plasma glucose level. A plasma glucose level of 140mg/dl or higher was considered a positive test and these women were considered for 100g OGTT. Using the Carpenter Coustan criteria (based on proceedings of the fourth International Workshop- Conference on Gestational Diabetes Mellitus), a diagnosis of GDM was made if the plasma glucose level: fasting,

95mg/dl, in 1hour=180mg/dl; 2h=155mg/dl; and 3hour= 140mg/ dl. (). All patients who had GDM were referred to a dietician and jointly managed by dietician, physiotherapist and an obstetrician. They were put on 1800 kilocalorie diet and started on insulin when indicated. For those women whose sugar levels were well controlled on diet, pregnancy was allowed to progress for spontaneous labour, while for those women who required insulin therapy; pregnancy was terminated at 38 completed weeks of gestation. The client was sent for fetal ECHO at 26-28of weeks of gestation. After delivery, all infants of diabetic mothers were assessed for congenital malformations, hypoglycaemia and other electrolyte and respiratory disorders. The outcome of the pregnancies was assessed by the gestation and mode of delivery and neonatal outcomes in terms of birth weights, Apgar scores, congenital abnormalities, hyperbilirubinaemia, hypoglycaemia and respiratory distress syndrome. The results were analyzed by Microsoft Excel 2010 using simple manual analysis of frequency and percentage.

RESULTS

A total of 15,413 pregnant women were screened antenatally with the 50g GCT. Of these, 1843 (11.95%) women were found to have a 50g GCT value of greater or equal to 140mg/dl. They underwent formal OGTT and 363(2.3%) women were found to have abnormal OGTT. In our study, we noticed that women in between 15-29 years were 14,527 and those with age more than 30 years were 886. Those with age >30 were found to have high GCT and abnormal OGTT compared to women lesser than 30 years, as we can see in table 3 that only 886 of women were in this age group and 97 of them had high GCT and 89 had abnormal OGTT, this gives us 10.94% among 886 patients and 10.01% with abnormal OGTT [Table-1].

Table-1: Demographic Profile

Age (years)	GCT>140mg/dl (n=1843)	Abnormal OGTT (n=363)
15-19	335 (18%)	-
20-25	894 (48.50%)	212(58.4%)
26-30	517 (28%)	62 (17.07%)
31-35	65 (3.52%)	57 (15.7%)
36-40	30 (1.62%)	30 (8.26%)
>45	2(0.1%)	2(0.5%)

In women with Body mass index (BMI) of >25, the prevalence of diabetes is higher. [Table-2] As compared to women with no risk factor the women who had risk factors are at more risk of developing diabetes [Table-3]. Ethnicity seems to play a role in development of GDM. In our study we observed that 1087 (59 %) women were Tamang, 718 (38.9%) women were from Newar ethnicity. We observed that abruption of placenta was seen in 11 patients with polyhydramnios and abnormal OGTT [Table-4]. Fetal Echocardiography was performed at 24.7±2.4, in patients with abnormal OGTT. Congenital heart disease like ventricular septal defect (VSD) was the commonest amongst women with abnormal OGTT. It was seen amongst 13 (3.58%) patients with abnormal OGTT [Table-5].

Table-2: Relation between BMI and high GCT and abnormal OGTT

BMI (n=15413)	GCT>140 (n=1843)	Abnormal OGTT (n=363)
18-20	184(9.98%)	12(3.30%)
21-25	1460(79.21%)	206(56.74%)
26-30	154 (8.35%)	120(33.05%)
31-35	28(1.51%)	20 (5.56%)
>35	17 (.92%)	5(1.37%)

Table-3: Abnormal GCT and OGTT in pregnant women with different risk factors

Risk factors	**Total patients (n=15413)**	**GCT> 140mg/dl (n-1843)**	**Abnormal OGTT (n=363)**
Age >30 years	886 (4.8%)	97(5.2%)	89 (24.51 %)
Obesity	385(2.49%)	199(10.79%)	25(6.88%)
Family history of Diabetes	308(1.9%)	35(2.9)	27(7.43%)
Grand Multipara (>4 births)	164 (1.06%)	110 (5.9%)	30 (8.26%)
Previous big baby	51 (0.33%)	38(0.9%)	33(9.09%)
Previous unexplained Intrauterine death	67 (0.43%)	19(1.03%)	12 (3.3%)
Previous baby with congenital anomaly	16 (0.10%)	12 (0.65%)	9(2.4%)
No risk factor	13,536 (87.82%)	1333 (72.32%)	138 (38.01%)

Table-4: Maternal outcome in women with high GCT and abnormal OGTT

Parameters	GCT>140mg/dl (n=1843)	Abnormal OGTT (n=363)
Preclampsia	214(11.61%)	95 (26.15%)
Ecclampsia	2(0.1%)	-
Abruptio placentae	107(5.8%)	35(9.6%)
Polyhydramnios	45 (2.4%)	32(8.8%)
Preterm labour	42(2.2%)	10(2.7)

Table-5: Perinatal outcome in women with abnormal OGTT

Parameters	Abnormal OGTT
Gestational age at birth	38.2±1.4
Birth weight	3720±328.5
Length (cm)	49±2.3
Macrosomia(>4000gms)	18(4.9%)
Premature birth	48 (13.22%)
Neonatal jaundice	43(11.8%)
Congenital heart disease	5(1.37%)
Other congenital anomalies	2(1.37%)

DISCUSSION

In a country like Nepal where women need to be encouraged to come for antenatal check up, The glucose challenge test (GCT) is a very appropriate test to screen for diabetes. It can be performed in all the pregnant women in out patient basis as it is easy, work friendly, cheap and convenient for screening purpose as stated by Wong L et al [8]. Apart from that, the women did not require to fast and they also appreciated the test after explaining the importance. No women complained about the adverse effects of test. So, it is feasible to perform 50g GCT in all pregnant women. It helps us to screen out the women with GDM. As GDM is notorious for causing adverse effects in pregnancy and also fetal outcome, so there is clear benefit by screening of GDM as it helps in early treatment.[3] Women with gestational diabetes had an increased risk of developing type 2 diabetes compared with those who had a normoglycaemic pregnancy.[9]

Amongst 15,413 women who underwent screening for GDM with 50g GCT, 1843 (11.95%) women were found to have an elevated level greater or equal to 140mg/dl and 363 (2.35%) women were found to have GDM. So, the incidence of GDM was 2.35% in pregnant women attending Dhulikhel Hospital, and the diagnostic yield was 6.06%. The incidence in our study is similar to Andrew Collier et al[6] and Yang HX et al which showed the incidence of GDM 2.7% [10], but is lower than that of the study performed by Wong L and Tang ASA which reported the incidence of 8.2% and diagnostic yield of 22.6%.[8] Similarly study performed by King H and Ray R et al showed the incidence comparable to our results.[11]

The study performed by Wong L and Tang ASA[8] showed that every one in five elevated GCT found to have GDM which was similar to our results as in our case every one in six elevated GCT found to have GDM. So study performed in 19,798 women, O'Sullivan reported a sensitivity of 79% and specificity of 87% using a threshold value of 130 mg/dl whole blood (or 7.9 mmol/l plasma). Based on his study, OGTT done for positive history or obstetrical risk factors yielded poor results with a sensitivity rate of 63% and specificity rate of 56%.In the 1980s those cut-off points were adapted to modern methods for measuring glucose and applied to the modern definition of gestational diabetes - glucose intolerance with onset or first recognition during pregnancy.[12]

Cousins, favored a cut-off of 130 mg/dl (7.2 mmol/l) while Carpenter, suggested the threshold value be set at 135 mg/ dl (7.5 mmol/l).[7,13] When the threshold was set at 140mg/ dl, we discovered that 12.39% of the population would need to be further tested with the OGTT and the diagnostic yield was 6. 06%. Since we do have poor patients came to our outpatient service so, for economic reasons, we recommend the threshold of 140mg/dl. At this threshold value, only one out of six of the screened population needs to undergo the OGTT.

We observed the epidemiological data to see any epidemiological risk factors associated with a raised GCT or OGTT result, we observed that high GCT and GDM were more amongst women of Mongol ethnicity. According to a study by Wild S et al, the total number of people with diabetes is projected to rise from 171 million in 2000 to 366 million in 2030, largely because of an increase in the proportion of people over 65 years of age.[13] The regions with the greatest potential increases are Asia and Africa, where diabetes rates are predicted to rise to two or three times those experienced today. The "top three" countries with the maximum prevalence of diabetes are India, China, and the USA [13]. Study performed by Ray R et al showed that older age that is 30 years and above, Chinese ethnic group, maternal obesity (body mass index > or = 25) and history of > or =

4 pregnancies were associated with raised GCT levels.[11] Our results also showed that the patient with BMI>26 had raised GCT and abnormal OGTT which is similar to study performed by Ray R et al but differ in presentation of age group as in our case the raised GCT and abnormal OGTT was in age group >20years.[11] It may be because in our study population women become pregnant in their younger age. Similarly study performed by Wong L and Tand ASA showed no statistical significant between the raised GCT with respect to age.[8]

Our finding indicates that the risk of GDM becomes significantly and progressively increased from 30 years onwards. This supports the American Diabetes Association recommendation on the use of age ≥25 years as the cutoff for screening and the observation that maternal age ≥25 years is the factor most predictive of GDM.[14] American Diabetes association has also recommended that In clinical practice, maternal age of ≥25 years should be adopted instead of ≥35 years or 40 years as a risk factor for the development of GDM.[14] We observed that Preeclampsia and Eclampsia is more common amongst women with high GCT and GDM compared to non diabetics, which is similar to a study by Chris L. Bryson et al.[15] We observed that with poor glycemic control polyhydramnios sets in in third trimester and it may lead to complications like abruption placentae.Though we did not see any adverse perinatal outcome as this was seen in the labour room. We could immediately take up the women for ceasarean section.We noticed that neonatal complications like hypoglycemia, hyperbilirubinemia, transient tachypnea of newborn and macrosomia was more common amongst women with high GCT and abnormal OGTT as in the study by Rashid FB et al.[16] Congenital heart disease like ventricular septal defect (VSD) was the commonest amongst women with abnormal OGTT. Our results also similar to the study performed by different authors.[17-19]

CONCLUSIONS

It is very important to find out GDM in pregnancy as it has adverse outcomes which are preventable; it is worthwhile to detect GDM by screening in pregnancy. The 50g GCT is easy, work friendly, cheap and convenient for screening purpose. It was well tolerated by all the patients. We recommend that the threshold value be set at 140mg/dl because only one-fifth of the population would need to undergo the OGTT and the diagnostic yield was 6.06 %.

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