Original Article

False Positive 1 Hour Glucose Challenge Test and Adverse Obstetric and Perinatal Outcomes

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Abstract

Objective: To determine the adverse obstetrics and perinatal outcome in false positive glucose challenge test group and negative glucose challenge test group.

Methodology: This cross sectional descriptive stuudy was conducted at the department of Obstetrics and Gynecology, Liaquat University of Medical and health Science. Study duration was six months from March 2016 to August 2016. All the pregnant women with 28 to 42 weeks of gestational age and maternal age >18 years were included. All the women were divided in two groups as 50 with false +ve glucose challenge test and 50 pregnant women with –ve glucose challenge test. Results of glucose challenge test were confirmed by OGTT. Data regarding false positive GCT as a significant independent risk factor for an adverse obstetric and perinatal outcome was entered in the proforma.

Results: On average, the patients in false positive GCT study group were older, of higher parity, and more frequently had chronic hypertension and high body mass index. This group had higher mean birth weight and higher rates of caesarean delivery and shoulder dystocia. This group also had higher rates of preterm delivery, severe pre-eclampsia and PPROM. After controlling for all confounding variables and effect modification; we determined that a false positive GCT was a significant independent risk factor for an adverse obstetric and perinatal outcome.

Conclusion: In conclusion, patients who had false positive GCT were at high risk for perinatal complications when compared to GCT negative patients.

Keywords: Gestational diabetes mellitus, Glucose challenge test, perinatal outcome.

Cite this article as: Baloch I, Mukesh R, Bajari N, Talpur S, Shaikh AP. False Positve 1-Hour Glucose Challenge Test and Adverse Obstetric and Perinatal Outcomes. J Soc Obstet Gynaecol Pak 2019; Vol 9(1):19-24.

Introduction

Gestational Diabetes Mellitus (GDM) is defined as Carbohydrate intolerance of variable severity with onset or first recognition during pregnancy.[1] This definition applies regardless of whether or not insulin is used for treatment. It has long been known that diabetic pregnant women are at risk of adverse outcome. Diabetes during pregnancy was measured as a fatal condition to the mother and foetus even prior the insulin discovery in 1921.[2] It was reasoned

Authorship Contribution: [1]Final approval of the version to be published, revising it critically for important intellectual content [2,3,4]Substantial contributions to the conception or design of the work drafting , [5]Data Analysis

Funding Source: none

Conflict of Interest: none

Received: Nov 21, 2018

Accepted: April 17, 2019

that pregnancy might unmask a latent glucose intolerance, which could subsequently develop into adult onset diabetes mellitus. The classic work of O' Sullivan and Mahan and O'sullivan et al., confirmed GDM as a precursor of adult onset diabetes mellitus.[3] Diabetes is the most common medical disorder of pregnancy. Patients can be separated into those who were known to have diabetes before pregnancy (overt diabetes mellitus) and those diagnosed during pregnancy (Gestational diabetes mellitus).

In 1993, a total of 102,234 American women had pregnancy complicated by diabetes representing 2.6 % of all alive birth in nation. It is estimated that 90 % of all pregnancies complicated by diabetes were due to gestational diabetes mellitus (GDM). In 1999, there were approximately 10,000 American women with overt diabetes mellitus and 90,000 with GDM delivered live birth.[4] GDM is associated with significant metabolic alteration, increased perinatal and maternal morbidity and mortality.

Previous recommendation for identifying and managing diabetes in pregnancy was based on risk of patient developing frank diabetes mellitus and not on prediction of adverse pregnancy outcome.[2] The clinical end point today is to decrease fetal pathology especially abnormally accelerated growth resulting in macrosomic (new born more than or equal to 4-4.5 Kg) or a fetus large for gestational age and its associated metabolic disturbances and risk of adult onset-diabetes mellitus. More than 75% of obstetricians in United States practice universal screening, however agreement is lacking worldwide. Among all these tests, 50 grams one hour oral glucose challenge test is gold standard for screening of GDM. American Diabetic Association has recommended in 2nd, 3rd and 4th conference that this test should be used for screening of GDM.[5]

Generally agreed threshold of serum glucose for further confirmation by 100 grams 3-hour OGTT is 140 mg/dl, but American College of Obstetrics and Gynecology has recommended that threshold can be lowered to 130 mg/dl to maximize the sensitivity at the cost of subjecting 25 % extra patients to diagnostic test.[6] Many clinicians consider patients with a false positive GCT as an intermediate risk population for adverse obstetric outcome. They noticed complications associated with GDM like preeclampsia, increased caesarean section rate, fetal macrosomia, neonatal hypoglycemia and perinatal death in these patients.[7] Although the proportion of fetal or maternal complications was not as high as in GDM, but it is raised if compared with normal pregnant population.[8] On the other hand, there are certain other studies, which remained unable to find such correlation. Studies on this topic have been conducted throughout the world but in our country no adequate data is available. As Asian population has been identified to be at a high risk for diabetes, it is not surprising that certain patients with false positive screening test might have adverse perinatal outcome. This study has been conducted to determine the proportion of adverse maternal and perinatal outcome in false positive Glucose Challenge Test patients.

Methodology

This cross sectional study was conducted at the department of Obstetrics and Gynecology, Liaquat University of Medical and health Science. Study duration was six months from March 2016 to August 2016. Hundred pregnant women with 28 to 42 weeks of gestational age and all age groups and parity, 50 with false +ve GCT and 50 pregnant women with –ve GCT were included. All the women with diabetes Mellitus, multiple gestations and anomalous fetuses were excluded from the study.

False positive glucose challenge test was defined as; blood glucose level greater than or equal to 140 mg/dl or 7.8 m mole /l, hour after 50gm glucose load followed by a normal 3-hour glucose tolerance test (GTT).

All women with serum glucose level >140mg on 50gm glucose challenge test were submitted to 3-hour OGTT and if results was negative then women were regarded as having a false positive GCT and any adverse outcome during the course of pregnancy and adverse perinatal outcome was recorded on predesigned proforma and this group of mothers and neonates was categorized as group "A". Women with serum glucose level <140 mg/dl, 1-hour after 50gm load were enrolled for the study and if any adverse maternal & perinatal outcome was recorded on a predesigned proforma during the course of pregnancy and these women were included in Group "B". Both

groups were compared for rates of adverse maternal perinatal outcomes.

Data was fed in computer software SPSS version.16. Frequency and percentage were computed for categorical data. Chi-square test was applied and a P-value of less than 0.05 was taken as significant difference.

Results

In this study, proportion of adverse obstetric and perinatal outcome is measured by the percentage of different variable. Negative GCT was more in multipara (2-4) i.e., in 56.6% of women while false-positive GCT was observed in 40% of multipara. On the other hand, false-positive GCT was more in grand multipara (>5) i.e. 26.6% as compared to 16.7% of negative GCT women. False-positive GCT was also more in primigravida i.e. 33.3% as compared to 26.6% having negative GCT. 70% of women with false-positive GCT had termed delivery as compared to 90% of women with GCT negative results. False-positive GCT groups had higher ratio of complications such as; Polyhydroamnios, abruption, preeclampsia, PPROM and Chorioamnionitis. More patients delivered as spontaneous vaginal delivery in GCT negative patients (60% as compared to 36%), whereas in false positive GCT group more patients had instrumental and caesarean delivery (20% and 43.3% as compared to 3.4% and 36%). Shoulder dystocia (13.3%) was frequent in false positive GCT group as compared to GCT negative group (3.3%); {P value=0.161}. Table I.

There were two IUD and one NND {6.7%} in false positive GCT group as compared to none in GCT negative group {P value=0.150}. GCT negative and false positive GCT. In false positive GCT group 53.3% of babies were admitted in NICU whereas in GCT negative patients they were 26.6%. This shows a significant difference between the two groups ($p<0.05$). The false positive GCT group encounters more macrosomic babies i.e., 26.7% as compared to 6.7% in GCT negative group; [p value=0.038]. No baby got an Apgar score of 8-10 in false positive GCT group, while 26.6% in GCT negative group had good Apgar score. The difference is statistically significant as {P value<.05}. According to Apgar score at 5 minutes, 86.67% of GCT negative babies had Apgar score of 8-10 as compared to 66.67% in false positive GCT group. {P value= 0.157}. Table II

Table No I: Distribution of subjects according to gravidity, antenatal complications, mode of delivery and shoulder dystocia in comparison between glucose challenge test positive and negative cases (n = 100)

Parameters	Glucose challenge test		P value
	Positive n=50	Negative n=50	
Gravidity			
Primi (1)	17(33.3%)	13(26.6%)	0.415
Multi (2-4)	20(40%)	28(56.6%)	
Grand Multi (≥ 5)	13(26.6%)	8(16.7%)	
Term delivery	35(70%)	25(50%)	
Preterm delivery	15(30%)	5(10%)	
Antenatal Complications			
Polyhydroamnios	4(8 %)	3(6 %)	0.153
Preeclampsia	5(10 %)	4(8 %)	
Abruption	4(8%)	3(6 %)	
PPROM	2(4 %)	1(2 %)	
Chorioamnionitis	5(10 %)	4(8 %)	
Mode of delivery			
Spontaneous vaginal delivery	18(36%)	30(60%)	0.034
Instrumental delivery	10(20%)	2(3.4%)	
Caesarean delivery	22(43%)	18(36%)	
Total	50	50	
Shoulder Dystocia			
Yes	7(13.3%)	2(3.3%)	0.161
No	43(86.67%)	48(96.67%)	

New born in both groups who were admitted in NICU, were admitted with jaundice, hypoglycemia, infections, respiratory distress syndrome, meconium aspiration, polycythemia and hypocalcaemia. Most of these neonates were found to have more than one complication during their stay in NICU. In false positive GCT group proportion were higher than the negative GCT group for the jaundice [20% compared to 6.7%], hypoglycemia [13.3% compared to none], respiratory distress syndrome [10% compared to 6.7%], and hypocalcaemia [6.7% compared to none]. Proportion of infections, meconium aspiration and transient tachypnea of new born are same in both groups. Two neonates in each group were admitted for observation because of poor Apgar score.

Neonates with intrauterine growth retardation [IUGR] were more in GCT negative group. Table III.

Table No II: Distribution of subjects according to Fetal Outcome in comparison between glucose challenge test positive and negative cases (n = 100)

Fetal Outcome	Glucose challenge test		P value
	Positive n=50	Negative n=50	
Mortality			
Alive	47(93.3%)	50(100%)	0.154
Dead	3(6.7%)	0(0%)	
NICU Admission			
Yes	27(53.3%)	28(26.67%)	0.035
No	23(46.6%)	32(63.33%)	
Weight of babies			
< 4 kg	37(73.3%)	47(93.3%)	0.038
≥ 4 kg	13(26.7%)	3(6.7%)	
Apgar score at 1 minute			
0-4	3(6.7%)	3(6.7%0	0.055
5-7	47(93.3%)	33(66.7%)	
8-10	0(o %)	13(26.6%)	
APGAR score at 5 minutes			
0-4	2(3.3%)	0 (0 %)	0.157
5-7	15(30%)	7(13.4%)	
8-10	33(66.67%)	43(86.67%)	

Table No III: Distribution of subjects according to reason for admission in comparison between glucose challenge test positive and negative cases (n = 100)

Reason for admission	Glucose challenge test		P value
	Positive n=50	Negative n=50	
Jaundice	10(20%)	3(6.7%)	0.012
Hypoglycemia	7(13.3%)	0(0%)	
Infection	2(3.3%)	2(3.3%)	1.000
Respiratory distress syndrome	5(10%)	3(6.7%)	0.467
Meconium aspiration	3(6.7%)	3(6.7%)	1.000
Rule out sepsis	2(3.3%)	0(0%)	
Observation	3(6.7%)	3(6.7%)	1.000
Intra uterine growth retardation	0(0%)	3(6.7%)	
Transient Tachypnea of newborn	2(3.3%)	2(3.3%)	1.000
Hypoglycemia	7(14%)	0	
Birth trauma	2(3.3%)	0	

Discussion

Patients with pregestational diabetes and GDM clearly are at increased risk for adverse obstetric outcome,[8] however the most commonly used diagnostic testing schemes for gestational diabetes are flawed with relatively poor negative and positive predictive values. The variability of common clinical practice reflects the inaccuracy of gestational diabetes screening that has been reported in the medical literature. With the available outcome research, many obstetric care providers treat patients with an abnormal 1-hour GCT and negative 3- hour GTT with more intensive observation or therapy, identifying these patients as “glucose intolerant or borderline diabetic”. Still, others maintain that such patients do not warrant-additional therapies because their test results do not meet the diagnostic criteria for gestational diabetes. Having a false positive GCT is identified as an independent risk factor for perinatal complications and patients with false-positive GCT could benefit from additional therapies such as more intensive fetal monitoring, nutritional counseling, or a diabetic diet. With this in mind, we developed a study to determine whether patient with a positive 1-hour GCT and a negative 3-hour GTT, namely a false-positive GCT, are at increased risk for adverse perinatal outcome. The results of our study suggest that having a false-positive GCT is an independent risk factor for adverse perinatal outcome, including the composite perinatal outcome variable, the composite maternal outcome variable, shoulder dystocia, fetal macrosomia, caesarean delivery, and intrauterine death. The current literature is replete with research on gestational diabetes screening and obstetric outcome, unfortunately, the body of literature is difficult to interpret because the diabetic testing scheme, study population, study methods and results vary among studies. Some research corroborates our findings, but other studies reflect an association between an abnormal GCT and adverse obstetric outcome. Rey et al[10] reported that patients with an abnormal GCT and single elevated value on the GTT are at increased risk for fetal macrosomia, neonatal hypoglycemia and neonatal hyperbilirubinemia. A case-control study of Okun et al[11] showed that patients with an abnormal GCT and no elevated value on GTT are at increased risk for fetal macrosomia. However, Verma et al[12] found no association between

elevated glucose level on GCT, GTT, fasting glucose test or 2-hour post prandial test and fetal macrosomia in patients with a positive GCT and a negative GTT. Similar to the above studies that investigated the National Diabetes Data Group screening algorithm, previous authors have shown that non-diabetic "glucose intolerant" patients identified by the WHO diagnostic criteria are at increased risk for shoulder dystocia, caesarean delivery, fetal macrosomia and preeclampsia.[13,14] However, Ramtoola et al,[15] using the WHO diagnostic criteria did not find an increase in perinatal mortality in non-diabetic glucose intolerant patient. Adverse effects were almost same in our study as described in earlier studies.[10, 14] Few other complications which have been frequently seen in neonates of diabetic mothers like IUGR and hypertrophic cardiomyopathy were not observed in this group. This is probably because blood sugar levels were not as much elevated in false positive GCT patients as was observed in gestational diabetic women. Therefore, this group should be classed as high-risk group or intermediate category. GCT is the most preferred method of screening worldwide, but in some studies, it does show a poor sensitivity.[16]

We would like to discuss the limitations of our study. First, our sample size was small. Another fact which affects our results was that being a tertiary care and centre easy access to neonatal intensive care unit, more babies were admitted there, which could be managed at mother's side. But on the other hand we better identified the different types of adverse effects which neonates developed for the same reason.

Conclusion

In conclusion, patients who had false positive GCT were at high risk for perinatal complications when compared to GCT negative patients (normal population). This include overall perinatal adversity, shoulder dystocia, macrosomia, increased rates of caesarean section and instrumental delivery, NICU admission and perinatal mortality.

Thus, false positive GCT patients should be identified as a high-risk population. They might be benefited form more intensive antenatal care like, nutritional counseling, specialized diet, frequent antenatal visits and antenatal fetal surveillance. Their blood sugar levels should be checked and should be well controlled[1]. Further studies might be needed to see whether treating this population would be beneficial.

Recommendation:

1. Every pregnant female should be screened for gestational hyperglycemia on the basis of history and diagnosis should be established by performing 75gm OGTT early.
2. Even minor abnormalities on GCT should be dealt seriously and meticulous management of the problem must be done by joint effort of obstetricians and diabetecians.
3. Self-monitoring of blood glucose levels should be encouraged.
4. All potential diabetics must have preconceptional evaluation, frequent antenatal visits and vigilant monitoring during labour.
5. Careful timing and appropriate mode of delivery with good diabetic control in the Intrapartum and postpartum period should be practiced.
6. Attendance of paediatrician at the time of delivery must be ensured.
7. Health education progammes should include information regarding hazards of gestational diabetes.

References

1. Rani PR, Begum J. Screening and diagnosis of gestational diabetes mellitus, where do we stand. Journal of clinical and diagnostic research: JCDR. 2016;10(4):QE01.
2. Dirar AM, Doupis J. Gestational diabetes from A to Z. World journal of diabetes. 2017;15;8(12):489.
3. Mishra S, Rao CR, Shetty A. Trends in the diagnosis of gestational diabetes mellitus. Scientifica. 2016; Article ID 5489015, 7 pages. http://dx.doi.org/10.1155/2016/5489015
4. Sheffield JS, Butler-Koster EL, Casey BM, McIntire DD, Leveno KJ. Maternal diabetes mellitus and infant malformations. Obstetrics & Gynecology. 2002;100(5):925-930.
5. Luewan S, Bootchaingam P, Tongsong T. Comparison of the screening tests for gestational diabetes mellitus between "one-step" and "two-step" methods among Thai pregnant women. Obstetrics and gynecology international. 2018;1-5
6. Shamsuddin K, Mahdy ZA, Siti Rafiaah I, Jamil MA, Rahima MD. Risk factor screening for abnormal glucose tolerance in pregnancy. Int J Gynaecol Obstet. 2001; 75:27-32.
7. Cho HY, Jung I, Kim SJ. The association between maternal hyperglycemia and perinatal outcomes in gestational diabetes mellitus patients: A retrospective cohort study. Medicine. 2016 ;95(36):e4712
8. Farrar D. Hyperglycemia in pregnancy: prevalence, impact, and management challenges. International journal of women's health. 2016;8:519.
9. Dirar AM, Doupis J. Gestational diabetes from A to Z. World journal of diabetes. 2017;8(12):489.
10. Rey E, Monier D, Lemonnier MC, Carbohydrate intolerance in pregnancy: incidence and neonatal outcomes. Clin Invest Med 1996; 19:406-415.
11. Okun N, Verma, Mitchell BF, Flowerdew G, Relative importance of maternal constitutional factors and glucose intolerance of pregnancy in the development of newborn macrosomia. J Matern Fetal Med. 1997; 6:285:290.

12. Verma A, Mitchell BF, Demianczuk N, Flowerdew G, Okun NB. Relationship between plasma glucose levels in glucose-Intolerant women and newborn macrosomia. J Matern fetal Med. 1997; 6: 187-193.
13. Moses RG, Griffiths RD. Can a diagnosis of gestational diabetes be an advantage to the outcome of pregnancy? J Soc Gynaecol invest. 1995; 2:523-527.
14. Aberg A, Rydhstroem H, Frid A. Impaired glucose tolerance associated with adverse pregnancy outcome: a population-based study in southern Sweden. An J Obstet Gynecol 2001; 184:77-83
15. Ramtoola S, Home P, Damry H, Husnoo A, Ah-Kion S. Gestational impaired glucose intolerance does not increase perinatal mortality in a developing country: Cohort study. BMJ. 2001; 322:1025-1026.
16. Stamilio DM, Olsen T, Ratcliffe S, Sehdev HM, Macones GA. False-positive 1-hour glucose challenge test and adverse perinatal outcomes. Obstet Gynecol. 2004; 103:148-156.