

ACCURACY OF 50 GRAM ORAL GLUCOSE CHALLENGE TEST IN THE SCREENING OF GESTATIONAL DIABETES MELLITUS

Tasneem Akhtar,¹ Samina Badar,² Rabia Noor,¹ Wajahat Hussain¹

ABSTRACT

Background: Gestational diabetes mellitus (GDM) is associated with increased perinatal morbidity & mortality, along with maternal complications in future. **Objective:** The objective of this study was to determine the diagnostic accuracy of 50 gram oral glucose challenge test in the screening of gestational diabetes mellitus. **Patients & Methods:** It was cross sectional study conducted in obstetrics and gynecology outpatient department of Bahawal Victoria Hospital, Bahawalpur, from 1st March, 2013 to 31st October, 2013, to determine the diagnostic accuracy of 50 gram oral glucose challenge test in screening of gestational diabetes mellitus (GDM). Sample size calculated for the study at 5% precision, 8% anticipated proportion of GDM and expecting the sensitivity and specificity as 95.3% & 48.6% respectively, from formula of sensitivity and specificity, was 416. Four hundred and sixteen primigravida and multigravida women of age 20-40 years with singleton pregnancy at 24-28 weeks of gestation visiting the obstetrics and gynecology outpatient department selected by non-probability convenient method were included in the study. 50 gram oral glucose in 250 ml of plain water was given to each participant, after one hour venous blood sample was withdrawn to measure serum glucose level and 140 mg/dl was taken as cut off value for labeling the patient as screen positive or negative. Regardless of the results of 50 gram oral glucose challenge test all the participants were further evaluated by oral glucose tolerance test (OGTT). Before doing OGTT all the patients were advised to come in the morning with overnight fast of 8-12 hours (plain water was allowed). After taking blood samples for fasting blood glucose level, 75 gram oral glucose was given and after two hours blood glucose level was measured again. Fasting blood glucose level ≥ 110 mg/dl and after 2 hours of taking 75 gram oral glucose, serum level of ≥ 160 mg/dl was taken as cut off values to label as test positive or negative. Data was entered and analyzed by using SPSS version 17. Accuracy of OGCT in terms of sensitivity, specificity, positive predictive value and negative predictive value was measured by assuming OGTT as gold standard test. **Results:** Gestational diabetes mellitus was recorded in 22.59% on OGCT. On OGTT 19.95% were found to have GDM. Sensitivity was calculated as 85.54%, specificity 93.03%, positive predictive value 75.53% and 96.27% negative predictive value. **Conclusion:** Our results suggest that 50 gm OGCT is a test with high accuracy and can be used as a screening test for GDM in all antenatal clinics.

Key Words: Gestational diabetes mellitus, Oral glucose challenge test, Screening

JSZMC 2014;5(2):588-590

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common condition affecting 0.6 to 15% of all pregnancies each year globally,¹ and in Pakistan the prevalence is 7.6-11%.² It appears at ≥ 20 weeks gestation and disappears immediately or up to 6 weeks after delivery.³ GDM is associated with increased perinatal morbidity and mortality. Short term maternal complication include increased incidence of urinary tract and genital tract infections, pre-eclampsia, progressive vasculopathy while fetal complications include intrauterine growth restriction, prematurity, ployhydramnios, sudden intra uterine deaths, hypoglycemia, impaired calcium and magnesium hemostasis neonatal jaundice, macrosomia leading to increase rate of caesarean section and

birth trauma in the form of brachial plexus and clavicular injuries and many more. Long term complications include, off springs of women with GDM are at risk of obesity, glucose intolerance and diabetes in young adult hood, 50% of women with GDM turn out to be diabetic in next 15 years.^{4,5,6} Early detection and treatment of Gestational Diabetes Mellitus (GDM) not only reduces and eliminates the risks for the fetus, it also provides an opportunity to warn the mother to adopt preventive measures like controlled diet, exercise and achieve ideal body weight, to halt or delay the process of onset of overt diabetes.⁷

There is no worldwide standard for screening and diagnosis of diabetes during pregnancy. Oral glucose tolerance test (OGTT) is a test for early diagnosis of GDM but it is time consuming, requires patient preparation by overnight fast and multiple blood samples for serum sugar level, hence cannot be used as screening test for early detection of gestational diabetes mellitus. This study was aimed to test the diagnostic accuracy of 50 gram oral glucose challenge test so that it can be used as screening tool for early detection of GDM and timely intervention to prevent fetal and maternal morbidities. This study

1. Department of Gynecology and Obstetrics, Quaid-e-Azam Medical College, Bahawalpur. University of Health Sciences, Lahore, Pakistan.

2. Department of Community Medicine, Quaid-e-Azam Medical College, Bahawalpur. University of Health Sciences, Lahore, Pakistan.

Correspondence: Dr. Tasneem Akhtar, Assistant Professor, Department of Gynecology & Obstetrics, Quaid-e-Azam Medical College, Bahawalpur, Pakistan.

Email: dr.tasneemakhtar@yahoo.com

Received: 10-12-2013

Accepted: 21-06-2014

was conducted to determine the diagnostic accuracy of 50 gram oral glucose challenge test in the screening of gestational diabetes mellitus.

PATIENTS & METHODS

It was cross sectional study, conducted in obstetrics and gynecology outpatient department of Bahawal Victoria Hospital, Bahawalpur, from 1st March, 2013 to 31st October, 2013 to determine the diagnostic accuracy of 50 gram oral glucose challenge test in screening of gestational diabetes mellitus (GDM).

Sample size calculated for the study at 5% precision, 8% anticipated proportion of GDM and expecting the sensitivity and specificity as 95.3% & 48.6% respectively from formula of sensitivity and specificity was 416.⁸

Four hundred and sixteen primigravida and multigravida women of age 20-40 years with singleton pregnancy at 24-28 weeks of gestation visiting the obstetrics and gynecology outpatient department, selected by non-probability convenient method were included in the study. Women not willing to be included in the study, having weight ≥ 70 kg, positive history of diabetes mellitus in first degree relatives, history of positive oral glucose tolerance test, given birth to infant weighing ≥ 4.5 kg and polyhydramnios in previous pregnancy were excluded from the study. Data was collected after approval from hospital ethical committee and informed written consent from patients by using questionnaire. All the patients were counselled about risks of GDM, importance of its early detection and procedure of the test was explained to each participant.

50 gram oral glucose in 250 ml of plain water was given to each participant, after one hour venous blood sample was withdrawn to measure serum glucose level and level 140 mg/dl was taken as cut off value for labeling the patient as screen positive or negative. Regardless of the results of 50 gram oral glucose challenge test all the participants were further evaluated by oral glucose tolerance test (OGTT).

Before doing OGTT all the patients were advised to come in the morning with overnight fast of 8-12 hours (plain water was allowed). After taking blood samples for fasting blood glucose level, 75 gram oral glucose was given and after two hours blood glucose level was measured again. Fasting blood glucose level ≥ 110 mg/dl and after 2 hours of

taking 75 gram oral glucose, serum level of ≥ 160 mg/dl was taken as cut off values to label as test positive or negative.

Results of OGTT in our study were classified as either normoglycemic or having GDM according to the criteria used. Data was entered and analyzed by using SPSS version 17. Accuracy of OGCT in terms of sensitivity, specificity, positive predictive value and negative predictive value was measured by assuming OGTT as gold standard test.

RESULTS

Mean age of the participants was 28.65 ± 3.45 years. Out of total 416 patients, 22.05% were in between 20-25 years, 34.82% in 26-30 years, 27.84% in 31-35 years and 15.65% in 36-40 years of age group (Table I). Gestational diabetes mellitus was recorded in 22.59% and 77.41% had no GDM on OGCT (Table II). On OGTT 19.95% were found to have GDM and 80.05% had no GDM (Table III). Sensitivity was calculated as 85.54%, specificity 93.03%, positive predictive value 75.53% and 96.27% negative predictive value (Table IV).

Table I: Age distribution of the study participants.

Age (in years)	Frequency (%)
20-25	92 (22.05%)
26-30	145 (34.82%)
31-35	114 (27.48%)
36-40	65 (15.65%)
Total	416 (100%)

Table II: Frequency of gestational diabetes mellitus on OGCT.

Gestational diabetes mellitus	Frequency (%)
Present	94 (22.59%)
Absent	322 (77.41%)
Total	416 (100%)

Table III: Frequency of gestational diabetes mellitus on OGTT.

Gestational diabetes mellitus	Frequency
Present	83 (19.95%)
Absent	333 (80.05%)
Total	416 (100%)

Table IV: Diagnostic accuracy of 50 gram oral glucose challenge test in the diagnosis of gestational diabetes mellitus

Results of OGCT	OGTT		Total
	Positive	Negative	
Positive	71	23	94
Negative	12	310	322
Total	83	333	416

DISCUSSION

Results revealed that mean age of the participants was 28.65 ± 3.45 years. Out of total 416 patients 22.05% were in between 20-25 years and 15.65% in 36-40 years of age group. Gestational diabetes mellitus on the basis of OGCT was found in 22% women while on OGTT it was observed in 20% females. Diagnostic accuracy of 50 gram oral glucose challenge test in the diagnosis of GDM has been revealed as 85.54% sensitive, 93.03% specific, positive predictive value 75.53% and 96.27% negative predictive value. A similar study conducted by Huynh J,⁵ Adegbola O et al also determined the sensitivity and specificity of 50 gram of oral glucose challenge test as 100% and 91%, these results are comparable with our study.⁹ In another study, by Salleh M et al found the sensitivity and specificity of 50 gram OGCT as 88% and 84% with positive predictive value of 82%.¹⁰ The results of above mentioned studies are also consistent with our study. GDM can be prevented by simple measures like creating awareness regarding intake of food because people are usually not aware of nutritional and caloric values of food. Carbohydrate based food is cheap and taken as staple diet and fats are used to add to the taste of the food. Moreover, lack of awareness regarding weight control puts them in the habit of excessive eating.^{10,11}

The situation is further accentuated during pregnancy, wherein the women are customarily advised to take the food for 'two'. This leads to obesity and unfortunately, this is taken as a sign of beauty and health in most of rural population. These facts put our population at higher risk for the development of diabetes and the importance of intensive screening for the detection of pre-clinical disease cannot be overestimated.¹²

CONCLUSION

Our results suggested that 50gm OGCT is a test with high accuracy and can be used as a screening test for GDM in all antenatal clinics. As in our study significant proportion of the cases were detected on re-screening and repeat OGTT, it is emphasized that re-screening at a later gestation of 28 weeks or beyond 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 future.

REFERENCES

1. Iqbal R, Rafique G, Badruddin S, Qureshi R, Cue R, Gray DK. Increased body fat percentage and physical inactivity are independent predictors of gestational diabetes mellitus in South Asian women. *Eur J Clin Nutr.* 2007;61:736-42.
2. Zargar AH, Sheikh MI, Bashi MI. Prevalence of Gestational Diabetes Mellitus in Kashmiri women for the Indian Subcontinent. *Diabetes Research Clin Pract.* 2004;66(2):139-45.
3. Shera AS, Jawad F, Maqsood A. Prevalence of diabetes in Pakistan. *Diabetes Res Clin Pract.* 2007;76:219-22.
4. Ang C, Howe D, Lumsdens M. Diabetes. In: David KJ, Carl PW, Philip JS, Bwrnard G, editors. *High risk pregnancy.* Philadelphia: Saunders. 2006: 996-7.
5. Huynh J, Ratnaik S, Bartalotta C. Challenging the glucose challenge test. *Aust NZJ Obstet Gynecol.* 2011;5:22-25.
6. Beucher G, Viaris LB, Dreyfus M. Maternal outcome of gestational diabetes mellitus. *J Gynaecol Obstet Biol Reprod* 2010;39:171-88.
7. Ben Haroush A, Yogew Y, Hod M. Epidemiology of Gestational Diabetes Mellitus and its associate with type II 1 Diabetes Mellitus. *Diabet Med.* 2004;21(2):103-13.
8. Iqbal R, Rafique G, Badruddin S, et al. Increased body fat percentage and physical inactivity are independent predictors of gestational diabetes mellitus in South Asian women. *Eur J Clin Nutr.* 2007;61(6):736-42.
9. Adegbola O, Lolly MM. Methods of screening of gestational diabetes between 24 and 28 weeks gestation. *J Gynaecol Obstet Biol Reprod.* 2010;39:20-28.
10. Salleh M, Nasrat AH, Jamal SH, Alsadaf MH, Mustafa EB. Screening for gestational diabetes mellitus in pregnant females. *Saudi Medical Journal.* 2000;21(2):155-60.
11. Lolemans K, Caluwaets S, Van Assche FA. Diet induced Obesity in the rats; A model for Gestational Diabetes Mellitus. *Am J Obstet Gynaecol.* 2004;190(3): 858-65.
12. King H, Rewers M. Diabetes in adults is now a third world problem. The WHO adhoc Diabetes reporting group. *Bull WHO.* 1991;69:643-8