

Single Step Glucose Tolerance Test as a screening Method for Gestational Diabetes Mellitus

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Abstract

Aim: To see efficacy of Step Glucose Tolerance Test after 75 gram glucose intake as a screening method for gestational diabetes mellitus of pregnant women on their first antenatal visit. *Method:* This study includes a total 150 pregnant women attending antenatal clinic for routine checkups were given a 75 gram glucose powder dissolved in a glass of water, to be consumed within 510 minutes irrespective to the time of the last meal and she was asked not to eat or drink anything other than water for next 2 hours. A venous blood sample was collected after 2 hours for estimating plasma glucose. Gestational diabetes mellitus was diagnosed if 2 hours plasma glucose was >140mg/dl these data's were tabulated and results were calculated. *Results:* Out of 150 womens enrolled in, 50 antenatal women was diagnosed as having GDM by single step test, which would have been missed if random blood sugar was taken as criteria. *Conclusion:* G75 glucose tolerance test is a simple, convinient and very sensitive method to detect gestational diabetes mellitus. We recommend universal screening of all pregnant women to improve maternal and perinatal outcome.

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Introduction

“Gestational Diabetes Mellitus”

is defined as carbohydrate intolerance with onset or recognition during pregnancy. The prevalence Of GDM in India varied from 3.8% to 21% in different parts of the country, depending on the geographical location and diagnostic methods used [1].

In the indian context, screening is essential in all pregnant women as Indian women have an eleven fold increased risk of developing glucose intolerance during pregnancy compared to caucasianwomen [2].

Compared to selective screening, universal screening for GDM detects more cases and improves maternal and neonatal prognosis [3].

To standarized the diagnosis of GDM, the world Health Organization (WHO) recommends using a 2 hour 75 gram glucose tolerance test (OGTT) with a threshold plasma glucose concentration of greater than 140mg/dl at 2 hour, similar to that of IGT (> 140mg/dl and <199mg/dl), outside pregnancy [4].

The Diabetes in pregnancy group of India (DIPSI) has given practice guildelines for GDM in Indian enviroment [5]. DIPSI recommends that a pregnant women walks into the antenatal clinic irrespective of the fasting state, she has to be given a 75 gram oral glucose load and at 2 hours a venous blood sample is collected for estimating plasma glucose. This one step procedure of challenging women with 75 gram glucose and diagnosing GDM is simple, economical and feasible. In this study group we have usedDIPSI guildelines for screeninnng GDM. Most of antenatal clinics in India are doing random bood sugar (RBS) for GDM. So in our study we have compared RBS and single step glucose tolerance test in picking up gestational diabetes.

Materials and Methods

The study was conducted in the department of Obstetrics and Gynaecology at Geetanjali Medical College and Hospital. A total 150 pregnant women attending antenatal clinic for routine check-ups were selected randomly for study. All selected women were given a 75 gram glucose powder dissolved in a glass of water, to be consumed within 5-10 minutes irrespective to the time of the last meal and she was asked not to eat or drink anything other than water for 2 hours. A venous blood sample was collected after 2 hours for estimating plasma glucose.

Gestational diabetes mellitus was diagnosed if 2 hours plasma glucose was >140mg/dl.

Results

The study was carried out among 150 pregnant women, both Random blood sugar and G-75pp samples were taken from these women and the data derived were used for analysis. Women having blood sugar >140 mg/dl 2 hours after receiving 75gm of glucose were diagnosed as gestational diabetes mellitus.

Table 1: Demographic profile

Age (Years)	No of Patients (n=150)	GDM (n=30)	Non GDM : GDM positive
<20 year	05(3.33%)	1 (3.33%)	5.0:1 (20)
20-25	50(33.33%)	7 (23.33%)	7.0:1(14.2)
26-30	56(37.33%)	9 (30%)	6.0:1(16.66)
31-35	34(22.666%)	10 (33.33%)	3.4:1(29.41)
>35	05(3.33%)	3 (10%)	1.6:1(62.5)

Table 2:

Parity	Nulliparous	Multiparous
GDM (n=30)	11 (36.66%)	19(63.33%)
Non GDM (n=120)	58 (48.33%)	62(51.66%)
TOTAL (n=150)	69 (46%)	81(54%)

Incidence of GDM in our study was found to be 20%.

The mean age of women in this study was 27.54 years. The prevalence proportion increases with age 20% to 62.5% (95% confidence limits: -8.380% to 11.51%), probability ($p < 0.193$). The majority of women were between 26-30 years of age group and among them 9 patient i.e. 30% were GDM positive. If ratio is taken then in age group ranging less than 20, one patient out of 5 were GDM positive, and in 20-25 age group GDM is observed in one among 7 women, and in patient above 35 year of age one out of 1.6 patient developed GDM. This suggests that with advancement of age, risk increases significantly

(Table 1).

20% population from total were having GDM from which in nulliparous it was 36.66% and in multiparous its was 63.33%, which found out to be double in multigravida. The prevalence of GDM was double in multiparous than nulliparous ($p > 1$) (Table 2), this can be due to increasing age in multiparous women, which is found true from Table 1.

Of 150 pregnant women by comparing random blood sugar and G-75 post-prandial, 20% have raised sugar after G-75 post-prandial and only 10% have raised sugar in random blood sugar samples. (Table 3).

Table 3:

G-75 PP sugar	No of Patient	RBS	No of Patient
Raised (≥ 140)	30(20%)	Raised (≥ 140)	15(10%)
Normal (<140)	120(80%)	Normal (<140)	135(90%)

Table 4:

BMI(Kg/m ²)	GDM (n=30)	Total Patients (n=150)	Percentage of Population having GDM positive
<20	3	22	13.63%
20-25	13	66	19.69%
25-30	12	54	22.22%
>30	2	08	25%

Chances of missing cases were almost 50% when relying on RBS which is common practice in our country. Patients with raised RBS were having more chances of raised G-75 PP ($p < 0.001$).

Highest number of patients i.e. 44%(66 patients) from the total subjects(150 patients) were having BMI range 20-25 and amongst them 13 patients were GDM positive and 53 patients were non-GDM. From total GDM patient's maximum (43.33%) i.e.13 patients were in 20-25 BMI range (Table 4).

By comparing each groups according to BMI range, Out of total 22 patients having BMI < 20 only 3 patient is GDM positive i.e.13.63% population are GDM positive. In group of BMI range 20-25 out of total 66 patients 13 are GDM positive, i.e. 19.69% population are GDM positive in this range. In group of 25-30 BMI

out of total 54 patient 12 are GDM positive i.e. 22.22% population are GDM positive and in group having BMI > 30 out of total 8 patients 2 is GDM positive i.e. 25% population are GDM positive. By comparing each group, the percentage of population having GDM positive increases as BMI increases. So GDM in a population is directly proportional to BMI i.e. as BMI increases so are the incidence of GDM ($p = 0.003$) (Table 4).

80% GDM patients had positive family history of diabetes mellitus and so chances of having GDM increases with positive family history of Diabetes Mellitus ($p > 0.05$) (Table 5).

Out of the 30 patient's having GDM no patient has history of GDM in previous pregnancy ($p > 0.05$).

Table 5:

Family H/o of Diabetes	GDM (n=30)	Non GDM (120)	Total (150)
Yes	24(80%)	72(60%)	96 (64%)
No	6(20%)	48(40%)	54 (36%)

Table 6:

GDM in previous Pregnancy	GDM (n=30)	Non GDM (120)	Total (150)
Yes	0(0%)	06(5%)	06 (4%)
No	30(100%)	114(95%)	144(96%)

Discussion

Compared to selective screening, universal screening for GDM detects more cases and improves maternal and neonatal prognosis[3]. Hence, universal screening for GDM is essential, as it is generally accepted that women of Asian origin and especially ethnic Indians are at a higher risk of developing GDM and subsequent type 2 diabetes [2].

To standardize the diagnosis of GDM, the World Health Organization (WHO) recommends using a 2-hour 75 g oral glucose tolerance test (OGTT) with a threshold plasma glucose concentration of greater than 140 mg/dL at 2 hours, similar to that of IGT (> 140 mg/dL and < 199 mg/dL), outside pregnancy [4].

- The IADPSG recommends that diagnosis of GDM is made when any of the following plasma glucose values meet or exceed: Fasting: 5.1 mmol/L (92 mg/dL), 1-hour: 10.0 mmol/L (180 mg/dL), 2-hour: 8.5 mmol/L (153 mg/dL) [7] with 75 g OGTT.
- Most of the time pregnant women do not come in the fasting state because of commutation and belief not to fast for long hours. The dropout rate

is very high when a pregnant woman is asked to come again for the glucose tolerance test [8]. Attending the rest prenatal visit in the fasting state is impractical in many settings [7].

- In all GDM, FPG values do not reflect the 2-hour post glucose with 75 g oral glucose [2-hour plasma glucose (PG)], which is the hallmark of GDM [9]. Ethnically Asian Indians have high insulin resistance and as a consequence, their 2-hour PG is higher compared to Caucasians [10]. The insulin resistance during pregnancy escalates further [11] and hence FPG is not an appropriate option to diagnose GDM in Asian Indian women. In this population by following FPG > 5.1 mmol/L as cut-o value, of pregnant women would have missed the diagnosis of GDM made by WHO criterion [12].
- A study performed by Crowther et al. found that treatment of GDM diagnosed by WHO criterion reduces serious perinatal morbidity and may also improve the women's health-related quality of life [14].
- Diagnosis of GDM with OGTT 2-hour PG? 7.8 mmol/L (140 mg/dL) and treatment in a combined diabetes antenatal clinic is worthwhile with a decreased macrosomia rate and fewer

emergency cesarean sections. e treatment of GDM women as dened by WHO criterion was associated with reduced risk of pregnancy outcome [15].

- Wahi et al. observed in their randomized controlled study, the advantage of adhering to a cut-o level of 2-hour PG 7.8 mmol/L in diagnosis and management of GDM for a significantly positive eect on pregnancy outcomes both in relation to mother as well the child [16].
- Perucchini et al. also suggest one-step diagnostic procedure (2-hour PG 7.8 mmol/L) to diagnose GDM [17].
- A long-term outcome study conducted by Franks et al. documented that when maternal 2-hour PG was 7.8 mmol/L, the cumulative risk of ospring developing type 2 DM was 30% at the age 24 years [18].

Performing this test procedure in the nonfasting state is rational, as glucose concentrations are aected little by the time since the last meal in a normal glucose tolerant woman, whereas it will, in a woman with gestational diabetes [21]. After a meal, a normal glucose tolerant woman would be able to maintain euglycemia despite glucose challenge due to brisk and adequate insulin response, whereas, a woman with GDM who has impaired insulin secretion [22], her glycemic level increases with a meal and with glucose challenge, the glycemic excursion exaggerates further [23] is cascading act is advantageous as this would not result in false-positive diagnosis of GDM. Advantages of the DIPSI procedure are:

- Pregnant women need not be fasting [18].
- Causes least disturbance in a pregnant woman's routine activities.
- Serves as both screening and diagnostic procedure.

This is single-step procedure has been approved by Ministry of Health, Government of India [24] and also recommended by WHO.

Conclusion

From the study it is concluded that G-75 PP is a better diagnostic test for early detection of GDM in pregnancy than random blood sugar.

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