

First Trimester Screening For Gestational Diabetes Mellitus with 75 Gram Glucose in Antenatal Cases- Need of Millenium

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Abstract

Gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition in pregnancy. Increasing trends of GDM has been evidenced in present decade affecting as high as 4% of pregnancies. It is an indirect cause of increased maternal as well as perinatal morbidity and mortality. Early diagnosis of GDM in first trimester helps in meticulous glycemic control for optimal maternal and fetal outcome.

Aims and Objective: Screening for gestational diabetes mellitus in 500 antenatal cases to do GCT with 75grams anhydrous glucose in pregnant women at their first visit. If GCT <140 mg/dl at first visit, then it will be repeated at 24-28 weeks and to evaluate risk factors for GDM.

Materials And Method: The present hospital based prospective observational and analytical study was conducted in Department of Obstetric and Gynecology in Rajindra Hospital, Patiala on 500 pregnant women at first visit to screen for GDM.

Results: Out of 500 antenatal cases at first visit, 437 antenatal women (87.4%) had GCT < 140 mg/dl, 63

antenatal women (12.6%) had GCT \geq 140 mg/dl. Out of 63 pregnant women with GDM, 44 pregnant women (69.84%) were \geq 24 weeks period of gestation at first visit followed by 17 pregnant women (26.98%) between 12-23 weeks and 2 (3.18%) were < 12 weeks of gestation. Out of 437 pregnant women with GCT <140mg/dl, 181 pregnant women (41.4%) were < 24 weeks period of gestation and these 181 pregnant women were followed up with repeat GCT at 24-28 weeks of gestation, among them 3 antenatal (2.27%) had GCT > 140 mg/dl.

Conclusion: Gestational diabetes mellitus is a frequent and rising complication that differentially impacts racial and ethnic minority populations depending on their underlying risk factors for diabetes.

Keywords: GDM, GCT, DIPSI, Macrosomia, Diabetes Mellitus, Preeclampsia.

Introduction

Gestational diabetes mellitus is defined as any degree of glucose intolerance with onset or first recognition in pregnancy.¹ Increasing trends of GDM has been evidenced in present decade affecting as high as 4% of pregnancies.² It is an indirect cause of increased

maternal as well as perinatal morbidity and mortality. GDM is an important public health problem in South East Asian countries. African American, Asian and Hispanic women are at higher risk for GDM compared to white women.³ The prevalence of GDM in Canada is 8-18% and in China it varies between 6.8% and 10.4%. In India, there is an exceptionally high estimated prevalence of GDM (27.5%) when compared to 9.9% in Sri Lanka and 9.8% in Bangladesh.⁴ Women with GDM have approximately seven fold or 50% risk of developing type 2 Diabetes over next 10 years. Pregnancy offers a unique opportunity to diagnose GDM among women at risk and to prevent its dreaded maternal and fetal complications and further type 2 diabetes later in life.²

GDM in previous pregnancy increases risk of developing GDM in subsequent pregnancy upto 30-50%. Moreover women with GDM are at increased risk of cardiovascular disease and the burden of GDM extends to their offspring, who themselves have an increased risk of obesity and diabetes- further perpetuating and potentially expanding the cycle of diabetes within families. Additionally, GDM has well known implications for the mother- most notably an increased risk of preeclampsia, abruption placenta and prematurity during pregnancy.⁵

Elevated blood glucose levels have adverse effects on fetus throughout pregnancy. At conception and during first trimester, hyperglycemia increases the risk of fetal malformation and later in pregnancy it increases the risk of macrosomia and metabolic complication at birth. Early diagnosis of GDM in first trimester helps in meticulous glycemetic control for optimal maternal and fetal outcome.⁶

Obesity, age more than 35 years, PCOS, essential hypertension or hypertension in pregnancy, prior GDM,

spontaneous abortion, unexplained infertility, persistent glycosuria, strong family history of diabetes are risk factor for GDM, however, no known risk factors are identified in 50% of patients with GDM.⁷ The National Family Health Survey III 2005-06, reported increasing prevalence of 14.8% of overweight women aged 15-49 years (28.9% in urban areas, 8.6% in rural areas) as compared to 10.6% in 1998-99. The increasing incidence of gestational diabetes during the past 15 years is reminiscent of similar statistics for obesity.⁸

Complications: Maternal and fetal complications in pregnancies with carbohydrate intolerance⁹

Maternal Complications	Fetal Complications
<ul style="list-style-type: none"> ➤ Increased UTI ➤ Hypoglycemia when using insulin ➤ Spontaneous abortion ➤ Premature birth ➤ Preeclampsia ➤ Polyhydramnios ➤ Stillbirth ➤ Increased Caesarean section chance ➤ Infections ➤ PPH ➤ Type 2 diabetes mellitus ➤ Diabetes ketoacidosis ➤ Worsening of diabetic retinopathy ➤ Deterioration of diabetic nephropathy 	<ul style="list-style-type: none"> ➤ Congenital malformations ➤ Fetal distress/ fetal death ➤ Macrosomia ➤ Shoulder dystocia ➤ Delayed fetal development ➤ Neonatal hypoglycemia ➤ Neonatal hyperbilirubinemia ➤ Neonatal polycythemia ➤ Respiratory distress syndrome ➤ Hypertrophic cardiomyopathy ➤ Obesity and diabetes in childhood

The basic cause of type 2 diabetes, whose prevalence is rapidly increasing worldwide, is genetic factors, with the addition of such acquired factor as lack of exercise, obesity caused by a high fat diet, stress and ageing. The incidence of GDM increases by approximately 8 times for pregnant women aged 35 years and over compared with women aged 25 years or under.⁹

Various Criteria for Diagnosis Of Gestational Diabetes Mellitus¹

Criteria	Method	Fasting (mg/dl)	1 hr (mg/dl)	2 hr (mg/dl)	3 hr (mg/dl)
WHO	Fasting 75gm OGTT	≥ 126	-	≥ 140	-
IADPSG	Fasting 75gm OGTT	≥ 92	≥ 180	≥ 153	
DIPSI	Non Fasting 75 gm OGTT	-	-	≥ 140	
ADA	Fasting 100 gm OGTT	≥ 95	≥ 180	≥ 155	≥ 140

Early detection of GDM and prediabetes is key to prevent or delay the progression from prediabetes to diabetes and to ensure early intervention to combat the risk for diabetes related complications and large randomized controlled trials have shown that intensive glycemic management in patients with diabetes leads to significant reductions in diabetes related maternal and fetal complications and earlier initiation of intensive treatment provides long term reductions in risk compared to later initiation of glycemic management. As such, identification of effective screening approach

is essential for early diagnosis of diabetes and in the interest of public health.¹⁰

Aims And Objectives

- Screening for gestational diabetes mellitus in 500 antenatal cases. To do GCT with 75grams anhydrous glucose in pregnant women at their first visit. If GCT < 140 mg/dl at first visit, then it will be repeated at 24-28 weeks.
- To evaluate risk factors for GDM

Material and Methods

The present hospital based prospective observational and analytical study was conducted in Department of Obstetric and Gynecology in Rajindra Hospital, Patiala on 500 pregnant women at first visit to screen for GDM.

Inclusion Criteria

Pregnant women at first antenatal visit at any period of gestation

Exclusion Criteria

Pregnant women with

- Diabetes mellitus
- Renal disease
- Liver disease

How to screen and interpret the results? Glucose Challenge Test

- The women should be given 75gm of glucose in 300 ml of water irrespective of the time of her last meal and whether she is fasting or not. (The glucose water can be taken slowly over 5 minutes time to avoid nausea and vomiting)
- Her venous blood is drawn after 2 hours of drinking of glucose solution and tested for plasma glucose.
- If the 2 hour post glucose load is ≥ 140 mg/dl, then she is considered as GDM.

- Test is considered negative if 2 hour post glucose load is < 140 mg/dl.

Informed written consent was taken from patient. After 2 hours of glucose intake 2-3 ml of venous blood was collected from the antecubital vein into anticoagulant (sodium/potassium fluoride) under aseptic conditions for GCT. The blood was mixed properly with anticoagulant and centrifuged at 2200-2500 rpm for separation of plasma. Plasma was used for analysis of GCT in antenatal cases. Antenatal women with negative GCT at first visit were called for repeat GCT with 75 grams at 24-28 weeks of gestation. The hospital based observational and analytical study was subjected to statistical analysis.

Reference values

Fasting blood sugar- 70-110 mg/dl

Post prandial blood sugar- 90-130 mg/dl

Glucose challenge test at 2 hour- ≥ 140 mg/dl

Observations

The present study was conducted on 500 pregnant women at first visit attending the OPD or IPD in, department of obstetric and gynecology at Rajendra hospital, Patiala.

Table 3: Distribution of Antenatal Cases According To Trimester at First Antenatal Visit

Trimester	No of Antenatal Women	Percentage (%)
First trimester	92	18.4
Second trimester	122	24.4
Third trimester	246	49.2
Total	500	100

Table 4: Table Showing Result Of 75 Grams GCT At First Visit

Blood Sugar (mg/dl)	No of antenatal women at first visit	Percentage (%)
<140 mg/dl	437	87.4
≥ 140 mg/dl	63	12.6
Total	500	100

Table 5: Distribution of Patients with GDM According To Period of Gestation at First Visit

Period of gestation	No of pregnant women	Percentage (%)
<12 weeks	2	3.18
12-23 weeks	17	26.98
≥ 24 weeks	44	69.84
Total	63	100

Table 6: Trimester Wise Distribution Of Pregnant Women With Negative GCT At First Visit

Period of gestation	No of pregnant women with GCT<140 mg/dl	Percentage
<24 weeks	181	41.4
24-28 weeks	256	58.5
Total	437	100

Table 7: Distribution of Pregnant Women According To Repeat Screening

Repeat GCT between 24-28 weeks of gestation	No of antenatal women	Percentage %
Yes	132	72.9
No	49	27
Total	181	100

Table 8: Result of 75 Gram GCT in Antenatal Cases after Repeat Screening at 24-28 Weeks Of Gestation

Blood sugar (mg/dl)	No. of Antenatal women at 24-28 weeks of gestation	Percentage (%)
< 140 mg/dl	129	97.73
>= 140 mg/dl	3	2.27
Total	132	100

Table 9: Distribution of Pregnant Women with GDM By Age Group

Age in years	No of pregnant women	Percentage (%)
16-20	0	0.0
21-25	8	12.1
26-30	35	53.0
31-35	18	27.3
36-40	5	7.5
Total	66	100

Table 10: Distribution of Pregnant Women with GDM by Residence

Residence	Number	Percentage %
Rural	40	60.6
Urban	26	39.4
Total	66	100

Table 11: Distribution Of Pregnant Women With GDM As Per Bmi (Who Criteria)

BMI (Kg/m ²)	No of pregnant women	Percentage (%)
<18 (underweight)	-	-
18-24.9 (Normal)	2	3.0
25-29.9		

(Overweight)	61	92.4
>=30 (Obese)	3	4.5
Total	66	100

Table 12: Distribution of GDM In Relation To Gravidity and Parity

Classification	No of pregnant women	Percentage (%)
G ₁	27	40.9
G ₂	25	37.8
G ₃	10	15.1
G ₄	2	3
G ₅	2	3
Total	66	100

Classification	No of pregnant women	Percentage (%)
P ₀	46	69.6
P ₁	15	22.7
P ₂	3	4.5
P ₃	1	1.5
P ₄	1	1.5
Total	66	100

Table 13: Distribution of GDM In Relation To Family History of Diabetes

Family history of Diabetes	No of pregnant women	Percentage (%)
GDM patients with family history of Diabetes	16	24.2
GDM patients without family history of Diabetes	50	75.7
Total	66	100

Table 14: Distribution of Pregnant Women with GDM by Thyroid Dysfunction

History of Thyroid Dysfunction	No of pregnant women	Percentage (%)
GDM patients with history of hypothyroidism	5	7.5
GDM patients without history of thyroid dysfunction	61	92.4
Total	66	100

Table 15: Distribution of GDM In Relation To Hypertension in Pregnancy

Classification	Gestation al age (weeks)	Maternal blood pressure (mmHg)	No of pregnant women	Percentage (%)
Gestational hypertension	>20	>140/90	3	4.5
Non Severe preeclampsia	>20	<160/110	6	9.1
Severe preeclampsia	>20	>160/110	1	1.5
Chronic hypertension	<20	>140/90	3	4.5
Without hypertension	>=1	120/80 (+-10%)	53	80.3
Total	-	-	66	100

Table 16: Mode of Delivery

Mode of Delivery	Number of pregnant women	Percentage (%)
Vaginal delivery	31	46.96
Caesarian section	35	53.04
CPD	11	16.67
Previous LSCS	14	21.21

Breech	6	9.09
Major degree placenta previa	3	4.54
Severe preeclampsia	1	1.51

Results

- Out of 500 pregnant women, 92 pregnant women (18.4%) were in first trimester, 122 women (24.4%) were in second trimester and 246 women (49.2%) were in third trimester. (TABLE 3)
- Out of 500 antenatal cases at first visit, 437 antenatal women (87.4%) had GCT < 140 mg/dl, 63 antenatal women (12.6%) had GCT >= 140 mg/dl. (TABLE 4)
- Out of 63 pregnant women with GDM, 44 pregnant women (69.84%) were >=24 weeks period of gestation at first visit followed by 17 pregnant women (26.98%) between 12-23 weeks and 2 (3.18%) were < 12 weeks of gestation. (TABLE 5)
- Out of 437 pregnant women with GCT <140mg/dl, 181 pregnant women (41.4%) were < 24 weeks period of gestation and 256 pregnant women (58.5%) were in 24-28 weeks period of gestation. These 181 pregnant women were followed up with repeat GCT at 24-28 weeks of gestation. (TABLE 6)
- Out of 181 pregnant women which showed GCT < 140 mg/dl at first visit, were followed with repeat GCT at 24-28 weeks, 49 women (27%) were lost to follow up. (TABLE 7)
- Out of 132 antenatal women who came for follow up, 129 antenatal women (97.73%) had GCT < 140 mg/dl at 24-28 weeks and 3 antenatal (2.27%) had GCT > 140 mg/dl.(TABLE 8)
- Out of 66 antenatal women with GDM, maximum women 35 (53%) were 26-30 years followed by 18

women (27.3%) in age group of 31-35 years, 8 women (12.1%) in 21-25 years age group, and 5 women (7.5%) in 36-40 years of age. (TABLE 9)

- In our study out of 66 pregnant women with GDM, 40 women (60.6%) were from rural area and 26 pregnant women (39.4%) were from urban area. (TABLE 10)
- Out of 66 pregnant women with GDM, 61 women (92.4%) were overweight followed by 3 women (4.5%) who were obese and 2 women (3%) with normal BMI.(TABLE 11)
- Out of 66 pregnant women, 27 pregnant women (40.9%) were primigravida, 25 pregnant women (37.8%) were second gravid, 10 pregnant women (15.1%) were third gravid, 2 each (3%) were fourth and fifth gravid.(TABLE 12)
- Out of 66 pregnant women with GDM, 16 women (24.2%) had family history of Diabetes and 50 women (75.7%) had no family history of Diabetes.(TABLE 13)
- Out of 66 pregnant women with GDM, 5 pregnant women (7.5%) had history of thyroid dysfunction and 61 pregnant women (92.4%) had no history of thyroid dysfunction.(TABLE 14)
- Out of 66 pregnant women with GDM, 6 pregnant women (9.1%) were having non severe preeclampsia, 3 pregnant women each (4.5%) were having gestational hypertension and chronic hypertension and 1 (1.5%) was having severe preeclampsia.(TABLE 15)
- In our study, 35 (53.04%) pregnant women underwent caesarian section out of them 14 (21.21%) pregnant women were previous LSCS, 11 (16.67%) pregnant women were having CPD, 6 (9.09%) were breech, 3 (4.54%) were major degree placenta previa and 1 (1.51%) was having severe

preeclampsia and 31 (46.96%) pregnant women delivered vaginally.(TABLE 16)

Discussion

Pregnancy causes considerable changes in carbohydrate tolerance. The diabetogenic effect of pregnancy is partway due to an increase in insulin demand, to the metabolic effects of sex steroids and other hormones whose secretion increases in pregnancy, and to the development of insulin resistance especially during second half of pregnancy.¹¹ Gestational diabetes mellitus is one of most common intricacies of pregnancy.¹²

In the present study, according to DIPSI criteria, 13.2% pregnant women had GCT ≥ 140 mg/dl they were diagnosed with GDM and 86.8% pregnant women had GCT < 140 mg/dl. Result of present study were similar with studies conducted by Shrestha et al¹³ 2011, who reported GCT ≥ 140 mg/dl in 12.3% pregnant women and 87.6% pregnant women had GCT < 140 mg/dl. Sharma et al¹⁴ 2013 also reported that 11% pregnant women had GCT ≥ 140 mg/dl, they were diagnosed with GDM and 89% pregnant women had GCT < 140 mg/dl. Similarly Puttaraju et al¹ 2015 in their study also found that 6.3% antenatal had GCT ≥ 140 mg/dl they were diagnosed with GDM and 93.6% pregnant women had GCT < 140 mg/dl, not having GDM.

Polur et al¹⁵ 2016 also reported that 42.2% pregnant women had GCT ≥ 140 mg/dl, were diagnosed with GDM and 57.7% pregnant women had GCT < 140 mg/dl, there were no complaint of GDM. Junnare et al 2016¹⁶ also reported that 6.5% pregnant women had GCT ≥ 140 mg/dl, they were diagnosed for GDM and 93.4% pregnant women had GCT < 140 mg/dl, they were not diagnosed for GDM. Kaur et al¹⁷ 2016 also reported that 8.1% antenatal women had GCT ≥ 140 mg/dl, they were diagnosed with GDM and 91.8%

pregnant women had GCT <140 mg/dl there were not having GDM. Roopa et al¹⁸ 2016 also reported that 3.5% pregnant women had GCT ≥140 mg/dl, they were diagnosed for GDM and 96.5% pregnant women had GCT <140 mg/dl they were not diagnosed with GDM.

In our study, out of 63 pregnant women with GDM, 44 pregnant women (69.84%) were ≥24 weeks period of gestation at first visit followed by 17 pregnant women (26.98%) between 12-23 weeks and 2 (3.18%) were < 12 weeks of gestation. Our study is similar with a study conducted by Sweeting et al¹⁹ in which out of 4808 women with GDM, 68 pregnant women (1.414%) were <12 weeks gestation, 1247 pregnant women (25.94%) were 12-23 weeks of gestation and 3493 pregnant women (72.64%) were ≥24 weeks of gestation.

In the present study, out of 66 antenatal women with GDM, maximum women 35 (53%) were 26-30 years followed by 18 women (27.3%) in age group of 31-35 years, 8 women (12.1%) in 21-25 years age group, and 5 women (7.5%) in 36-40 years of age. Result of present study matched with study conducted by Leng et al²⁰ 2015 who reported that maximum number of pregnant women with GDM were in age group 26-30 years (65.2%). Some studies conducted by Sharma et al¹⁴ 2013, Shrestha et al¹³ 2011 reported maximum cases in age group 21-25 years. Kaur et al¹⁷ 2016, Quazi et al²¹ 2016 reported maximum number of cases in age group 31-35 years.

In the present study, according to BMI 3% pregnant women with GDM had normal BMI, 92.4% women with GDM were overweight and 4.5% women were obese indicating that overweight and obesity is an important risk factor for GDM. Result of present study are comparable to study conducted by Kaur et al¹⁷ 2016, in which they reported 100% pregnant women

with GDM were overweight according to BMI. Leng et al²⁰ 2015 studied that maximum number of women with GDM were obese according to BMI.

In the present study, 40.9% pregnant women with GDM were primigravida, 37.8% were second gravid and 21.2% were multigravida. Similarly studies by Kaur et al¹⁷ 2016 and Rashmi et al²² 2016 reported maximum percentage of pregnant women with GDM were primigravida.

In the present study, 69.6% women with GDM were nullipara, 22.7% were para 1, 4.5% were para 2 and 3% were multipara. Similarly in a study by Rajput et al 2013 maximum number of pregnant women with GDM were nullipara. Some studies conducted by Shrestha et al¹³ 2011, Helena et al²³ 2015 reported that high percentage women were para 1.

In our study, 24.2% pregnant women with GDM had family history of diabetes and 75.7% pregnant women with GDM had no family history of diabetes. Result of present study matched with study conducted by Orluwene et al²⁴ 2013 who reported that 26.3% pregnant women with GDM had family history of diabetes and 73.7% pregnant women with GDM had no family history of diabetes.

In the present study, 7.5% pregnant women with GDM had history of thyroid dysfunction and 92.4% pregnant women with GDM had no history of thyroid dysfunction. Result of present study matched with study conducted by Kaur et al¹⁷ 2016 who reported that 13.3% pregnant women with GDM had history of thyroid dysfunction and 86.6% pregnant women with GDM had no history of thyroid dysfunction. Majority of risk factors inventoried by American Diabetes association²⁵ and Australian Diabetes in Pregnancy Society²⁶ are cognate with our study.

Out of 66 pregnant women with GDM, 6 pregnant women (9.1%) were having non severe preeclampsia, 3 pregnant women each (4.5%) were having gestational hypertension and chronic hypertension and 1 (1.5%) was having severe preeclampsia in our study. Similar result were found in a study conducted by Shrestha et al¹³, Kaur et al¹⁷ and Khalli et al.²⁷ Screening for GDM and its treatment can considerably reduce risk of fetal macrosomia, shoulder dystocia, preeclampsia and incidence of caesarian section.

Conclusion

Gestational diabetes mellitus is a frequent and rising complication that differentially impacts racial and ethnic minority populations depending on their underlying risk factors for diabetes. Whether GDM is under-diagnosed or over-diagnosed, the aim of screening and diagnose is to reduce obstetric and perinatal morbidity. The diagnosis of GDM is an excellent window of opportunity to prevent the development of type 2 diabetes and its subsequent sequel. Hence, an important public health priority ,is screening for diabetes, starting with maternal health post conception.

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