COMPARATIVE EFFECT OF 75 GRAMS GLUCOSE CHALLENGE TEST WITH FASTING AND POST PRANDIAL PLASMA GLUCOSE VALUES IN THE SCREENING OF GESTATIONAL DIABETES MELLITES

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CERTIFICATE

This is to certify that the dissertation titled "**COMPARATIVE EFFECT OF 75 GRAMS GLUCOSE CHALLENGE TEST WITH FASTING AND POST PRANDIAL PLASMA GLUCOSE VALUES IN THE SCREENING OF GESTATIONAL DIABETES MELLITES"** is the bonafide work done by **Dr. O. INDU ARUN BHARGAVI** between September 2008 to August 2009 during her M.D.,O.G., course at ISO - KGH, MMC Chennai.

DEAN	DIRECTOR
MADRAS MEDICAL COLLEGE	INSTITUTE OF SOCIAL OBSTETRICS – KASTURBA GANDHI HOSPITAL

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ETHICAL COMMITTEE CERTIFICATE

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I, DR.O.INDU ARUN BHARGAVI apply for the ethical committee certificate for the project "COMPARATIVE EFFECT OF 75 G GLUCOSE CHALLENGE TEST WITH FASTING AND POST PRANDIAL BLOOD SUGAR VALUES IN THE SCREENING OF GESTATIONAL DIABETES MELLITUS" under the guidance of Dr.Vasantha. N. Subbiah M.D.DGO., Director ,Institute of Social Obstetrics,Govt. Kasturba Gandhi Hospital ,Triplicane,Chennai-5

I understand the implications of doing research with human subjects and willfully comply with the regulations and keep the dignity and protect the health of subjects at all costs.

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I Have no objection to guiding this postgraduate student in the project mentioned above.I Shall pervise to the extent that all the human rights are protected and research is carried on with utmost humanitarian principles.

Signature of the Guide

Seal of Guide

Senior Civil Surgeon
Institute of Social Obstetrics and
Govt. Kasturba Gandhi Hospital for
Women, [illegible] ren, Chepauk,
Triplicane, Chennai-600 005

I Certify that this project has been presented in front of the Ethical Committee on duly formated in this Institution and that all the members of the ethical committee have given permission to conduct this research.

CHAIRMAN ETHICAL COMMITTEE

Professor & Head
Dept. of Community Medicin
Stanley Medical College
Chennai-600 001.

Date

Seal

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NDEX

INTRODUCTION

INTRODUCTION

Pregnancy is a time when serial metabolic adaptations in maternal fuel metabolism and hormones occur, in order to accommodate a rapidly growing tissue transplant, the conceptus. Subtle perturbation in these changes can have implication not only for the index pregnancy but also for the future generation.

Diabetes is the most common medical complication of pregnancy. Women can be separated into those who were known to have diabetes before pregnancy - PRE GESTATIONAL / OVERT DIABETES and those diagnosed during pregnancy - GESTATIONAL DIABETES MELLITES (GDM). GDM as a concept began in 1964 when O'Sullivan and Mahan performed the oral glucose tolerance test.

Ethnically Indian women have high prevalence of diabetes and the relative risk of developing GDM in Indian women is 11.3 times compared to white women, necessitating universal screening for glucose intolerance during pregnancy in India. Screening for GDM is an example of how timely intervention that costs very little and enables easy management of the condition can help in reducing the risk of both mother and child becoming diabetic at a later stage.

Several studies have established that elevated glucose levels can be detected through screening even as early as 16th week of pregnancy and that the condition shows up at all the trimesters. 2 to 2.5 % of GDM prevalence was found in the 16th

week, 2.5 to 3 % cases were detected during the 24th week and 3% in the 32nd week, recorded during the Tamil Nadu programme. This is being reviewed in this study.

REVIEW OF LITERATURE

REVIEW OF LITERATURE

O'Sullivan[1] and Mahan in their classical study of 1964, analyzed glucose response over 3 hours to a 100 grams oral glucose challenge, performed on venous whole blood by the Somogyi – Nelson (S – N) technique, in 752 healthy pregnant women in Boston. Gestational diabetes mellitus was diagnosed when two or more blood glucose concentrations were more than 2 SD above the mean. The investigators' initial interest was in the ability of such a finding to predict the development of diabetes in later life. 2.5% of the population was defined as having GDM in his study.

Diagnosing GDM and instituting aggressive management of the mother are intended to reduce or eliminate the perinatal, neonatal and long term complications in the offspring. O'Sullivan and Mahan's criteria were too lax for the identification of people at risk for perinatal morbidity associated with carbohydrate intolerance.

The National Diabetes Data Group (NDDG) revised the criteria in 1979, calculating the equivalent glucose oxidase plasma values from the original data[2] by using a conversion factor of 1.14. Technical modification of that conversion have been recommended by Carpenter and Coustan[3] in 1982, as being more representative of the true plasma glucose determination. This modification results in a lowering of all glucose levels in the 3 hour OGTT, thus increasing the sensitivity

of the test. By using the lower modified criteria, overall incidence of GDM is increased by 56%. Sacks & associates conducted simultaneous determinations using the S – N and glucose oxidase techniques and discovered that NDDG conversions were above the 95% confidence limits for all but the fasting sample, whereas the Carpenter & Couston conversions were always within the 95% confidence intervals[4]. Data on the modified criteria was presented at the 4th International Workshop on gestational diabetes. Infants of women meeting these lower criteria are at risk for potential morbidity including macrosomia. Hence, Carpenter and Coustan criteria was adopted for diagnosis.

Table 3. Diagnostic Criteria for GDM Using the 100 g OGTT

	O'Sullivan21*	NDDG48**	Carpenter and Coustan49**
Fasting	90 mg/dl	105 mg/dl	95 mg/dl
1-hour	165 mg/dl	190 mg/dl	180 mg/dl
2-hour	145 mg/dl	165 mg/dl	155 mg/dl
3-hour	125 mg/dl	145 mg/dl	140 mg/dl

The diagnosis requires any two values to meet or exceed those listed above.

* Venous whole blood, Somogyi-Nelson analysis.

** Plasma, glucose oxidase.

The NDDG criteria are recommended for the diagnosis of GDM by ACOG and the Expert Committee on the Diagnosis and Classification of Diabetes Mellitus.

The 4th International Workshop[5] on GDM defined cut off values for the controversial 75 grams OGTT in pregnancy. The cut off values were arbitrarily defined based on the mean plus 1.5 SD of the OGTT values in a study of over 3500 patients. Greater experience in the use of 75 grams OGTT and maternal & infant outcomes data will be needed to define better cut off values for this test. Data are

becoming increasingly available to suggest that a single abnormal value on GTT may predict perinatal outcome. Tallerigo et al examined the neonatal outcome in 249 women and found that 2 hour plasma glucose concentration after 100 grams OGTT significantly correlated with infants' birth weight.

Because of lack of reproducibility of the glucose tolerance test, together with the discrepancies in the number of abnormalities, much effort has gone into establishing simpler diagnostic criteria for GDM. Neither glycated hemoglobin nor fructosamine is sufficiently sensitive for identification of women with GDM.

Stangenberg et al[6] examined 6969 random plasma glucose levels for 1500 pregnant women without any signs and symptoms of diabetes with a threshold of 120mg/dl. 11.6% of them had abnormal glucose values and 5.8% had abnormal glucose tolerance test result. The overall prevalence of GDM identified was only 0.9%, which was substantially less than that in O'Sullivan's study. This suggests that a protocol that uses random plasma glucose levels may have a substantial false negative rate.

The second International Workshop on GDM in 1985 defined GDM as "Carbohydrate intolerance of varying severity with onset and first recognition

during the present pregnancy" and this is the current widely accepted definition of gestational diabetes mellitus. It was concluded that, the best screening test was 50 grams, 1 hour glucose challenge test and 1 hour plasma glucose determination in excess of 140 mg/dl constitutes a positive screen and requires the performance of the traditional 100 grams OGTT for confirmation of GDM.

Naylor et al[7] evaluated data on over 3000 pregnant women and developed a scoring system to determine the risk of GDM based on age, body mass index and race. The American Diabetes Association position statement suggests that it is not cost effective to screen women at low risk. This new policy has been controversial, however, with some suggesting that 10% of patients with GDM would be missed if all women were not screened. Owen and colleagues (1995) surveyed in USA and found that 97% were using universal screening test between 24 to 28 weeks of gestation.

Gabbe[8] in 1980 in his masterly review titled "Management of Diabetes in Pregnancy, six decades of experience" traced the history of management of this condition and identified four distinct periods as shown below:

<u>Aim of Care:</u>

1921 to 1940 - Avoid ketoacidosis

1941 to 1970 - Team care / early delivery

1971 to 1976 - Fetal surveillance

1976 to 1992 - Aim for normoglycemia

Glucose traditionally has been used as the marker for GDM because of its ease of measurement and test reproducibility. It is now clear that alteration in insulin secretion, insulin sensitivity and carbohydrate, fat and amino acid metabolism are all intrinsic abnormalities in the state that we have to accept as GDM. Developing more sensitive indices for prediction of perinatal morbidity may require either intensification of glycemic criteria or the inclusion of more sophisticated metabolic measurements.

According to ACOG (1994) the sensitivity of screening may be improved by using a 130 mg/dl threshold rather than 140 mg/dl to design an abnormal response to a 50 gm test. Use of low threshold value may increase the detection of GDM from 90 to 100 per cent but at an expense of subjecting 25% of pregnant women to 3 hour OGTT. Women with previous history of GDM may benefit from earlier screening. If screening in early pregnancy yields a normal test, subsequent screening should be performed at 24 to 28 weeks according to ACOG (1994).

David Stamilio et al[9] in January 2004, performed a retrospective cohort study of 1825 eligible pregnant women among a cohort of 1998 patients. Patients were screened for GDM with the one hour 50 grams OGCT at 24 to 28 gestational weeks. False positive GCT was defined as a result ≥ 135 mg/dl followed by a normal 3 hours OGTT. Comparison was made between negative GCT and false positive GCT for a composite perinatal outcome. Variables that included were fetal macrosomia, antenatal death, shoulder dystocia, chorioamnionitis, pre ecclampsia, NICU admission, caesarean delivery and post partum endometritis. The results were 164 patients with a false positive GCT and 50 patients with GDM. The false positive GCT cohort on average was older, was of higher parity, had a higher BMI and more frequently had chronic hypertension, sickle cell trait and elevated mid trimester hCG. False positive GCT was more frequently associated with adverse perinatal outcome including composite perinatal outcome (odds ratio 5.96), macrosomia more than 4.5 kg (odds ratio 3.66), antenatal death (odds ratio 4.61), shoulder dystocia (odds ratio 2.85), endometritis (odds ratio 2.18) and caesarean delivery (odds ratio 1.76).

The University of Pennsylvania Institutional Review Board approved this study. So patients with false positive GCT could benefit from additional therapies such as more intensive fetal monitoring, nutritional counseling or a diabetic diet.

The result of this study suggests that having a false positive GCT is an independent risk factor for adverse perinatal outcome.

Rey et al[10] reported that patients with an abnormal GCT and a single elevated value on the OGTT are at increased risk for fetal macrosomia, neonatal hypoglycemia and neonatal hyperbillirubinemia. Okun et al showed that patients with an abnormal GCT and no elevated values on the OGTT are at increased risk for fetal macrosomia.

Sun et al[11], in 1995 did a prospective study on the relationship between 50 grams GCT and pregnancy outcome. 50 grams OGCT was performed 622 pregnant women and 75 grams OGTT was further done on subjects with screening test value of ≥ 140 mg/dl. 16.56% (103) had elevated GCT values, among whom 32 were identified as having gestational impaired glucose tolerance and 12 GDM by confirmatory test of 75 gms OGTT. Sensitivity was 42.72%. The incidence of PROM, fetal macrosomia, operative deliveries and perinatal morbidity were higher in women with GIGT (Gestational impaired glucose tolerance) / GDM than in women without GIGT / GDM. It suggests that 50 grams GCT is the ideal method of screening for GDM and should be performed on all pregnant women.

Lao et al[12] in 2002 in Queen Mary Hospital, Hongkong, studied on 461 large for gestational age babies, the relationship between WHO category of IGT (2 hour value of 75gms OGTT at 140 mg/dl) and outcome in LGA infants to determine whether IGT affects perinatal morbidity in addition to affecting infant size. OGT group had significantly higher mean maternal age, pre pregnancy weight and body mass index, but no difference in infant's gestational age and birth weight. However IGT group had increased incidence of Erb's palsy, meconium aspiration, photo therapy, sepsis and shoulder dystocia.

According to Leslie et al[13] 1978, there is also a definite increased incidence of congenital malformations in infants born to diabetic mothers. Good diabetic control however reduced the incidence of congenital malformations even in patients with vascular complications. This indicates that the level of blood sugar elevation is a factor that influences the incidence of congenital malformation. Also, confirmed by the fact that more infants with congenital malformation are born of women with high HbA_1C levels before pregnancy, than of women who have normal levels.

In 1992, Rizvi et al[14], subjected 2230 antenatal women, irrespective of gestational age, to a 75 grams glucose challenge followed 2 hrs later by plasma glucose determination. The test was repeated at 28 to 32 wks of gestation for those

who had an abnormal initial screen at less than 28 wks of gestation followed by a normal GTT and for those who had a high risk factor for gestational diabetes even though the initial screen at < 28 wks was normal. The initial GCT was abnormal (2hr plasma glucose >140 mgs) in 8.6 % of screened population. An OGTT on these patients, revealed prevalence for the entire population of 3.5% of gestational diabetes and 1.9% of impaired glucose tolerance based on modified O'Sullivan criteria. Patients with abnormal GTT were older, had higher parity, a past history of macrosomia and a family history of DM compared to controls.

They also had a higher incidence of preterm labor and cesarean section. In the neonates, hypoglycemia and hyperbillirubinemia were similarly higher. The fetal abnormality rate was 5.6% and the perinatal mortality was 28/1000, which was higher than controls. Improvement in cost effectiveness of screening programs was adjudged possible by avoiding GTT in patients with 2 hr plasma glucose values > 170mgs after 75grams oral glucose challenge for screening.

Schmidt and Duncan et al[15] evaluated American Diabetes Association (ADA) and WHO diagnostic criteria for GDM against pregnancy outcomes in 4977 Brazilian women in 2001. All were subjected to a 2 hr 75 grams OGTT between 24 to 28 wks of gestational age and were followed to delivery. New ADA criteria for

GDM require two plasma glucose values ≥ 5.3mmol/l (fasting), ≥ 10mmol/l (1 hr) and ≥ 8.6mmol/l (2 hr). WHO criteria require a plasma glucose ≥ 7mmol/l (fasting) OR ≥7.8mmol/l (2 hr). They concluded GDM based on a 2 hr 75 grams OGTT defined by either WHO or ADA criteria predicts adverse pregnancy outcomes.

De Sereday and Damiano et al[16] determined which of ADA or WHO plasma glucose criteria for GDM best predicts poor fetal outcome. They also determined whether an alternative cut off point would result in increased predictive value and greater diagnostic effectiveness in pregnancies at risk for GDM. They concluded that the standard 2 hr cut off value of 140 mg/dl for the 75 grams test, as now recommended by WHO, was optimal for predicting macrosomia. The 2 hr, 75 grams OGTT value using a cut off point of 119 mg/dl had equivalent sensitivity, specificity and positive predictive value. In contrast, the 100 grams OGTT had much lower levels of sensitivity but higher specificity and higher positive predictive value.

Vijayam Balaji et al[17] screened 507 pregnant women with a 75 gms glucose challenge test. Diagnosis was based on WHO criteria of a 2 hr plasma glucose level ≥ 140mg/dl. In the fasting sample, in addition to plasma glucose, HbA_1C was measured. Among the women screened 50.3% were in 1st trimester of pregnancy. In this group 16.96% had GDM. Applying the cut off of 6% for A_1C levels, these

women were categorized into 4 groups. Group 1: GCT positive and $A_1C \geq 6\%$. Group 2: GCT positive and $A_1C < 6\%$. Group 3: GCT negative and $A_1C \geq 6\%$. Group 4: GCT negative and $A_1C < 6\%$. They found out that, women with an early diagnosis of GDM, in the first half of pregnancy, represent a high risk sub group within the GDM population and have an increased incidence of obstetric complications, recurrent GDM in subsequent pregnancies, and future development of type 2 diabetes. Hence, women with GDM in early pregnancy could benefit from earlier metabolic control. Also pregnant women with normal GCT but $A_1C > 6\%$ and women with A_1C values between 5.3 and 6% require utmost attention.

In 2005, Seshiah et al[18], studied the merits and demerits of different screening and diagnostic procedures that are used at present and to find a one step procedure which serves both as a screening as well as a diagnostic test. He subjected 891 pregnant women in the 2nd and 3rd trimester to a 50 grams GCT, and blood sample was collected after 1 hr. All of them, irrespective of the glucose value after the GCT, were instructed to come back after 3 days for a subsequent 75 gms OGTT recommended by WHO. Among them 144 (16.2%) were diagnosed as GDM as per the WHO criteria of 2 hr post plasma glucose (PPG) ≥ 140mg/dl. Analysis of these GDM cases revealed that, 113 (78.5%) had the initial 50 grams value > 130 mg/dl whereas potential 31 cases (21.5% of total GDM cases) had the 50 grams 1 hr value

below the cut off level of 130 mg/dl. He concluded that diagnosis of GDM by OGTT based on initial screening leaves 21.5% undiagnosed and that GCT lacks specificity (41.8%). The 2 step procedure of screening with GCT and then diagnosing GDM based on the cut off values with 100 g or 75 g OGTT is not practical. Hence, he suggested a single glucose challenge test with 75 g of oral glucose load and diagnosing GDM if 2 hr PPG is ≥ 140 mg/dl as recommended by WHO. This method serves both as a one step screening and a diagnostic procedure, and is easy to perform besides being economical.

In 2007, C.Anjalakshi et al[19], undertook a study, to elucidate a test that is casual, patient friendly and reliable to diagnose GDM. In this study a total of 800 pregnant women underwent 75 grams glucose challenge test irrespective of the time of the last meal and their 2 hr plasma glucose was estimated. They also underwent a 2 hr 75 grams OGTT recommended by WHO after 72 hrs. There was no statistically significant difference in the glycemic profile between GCT and WHO OGTT in the diagnosis of GDM. In conclusion, GCT performed irrespective of the last meal timing, is a patient friendly approach and causes least disturbance in the pregnant women's routine activities.

V Seshiah, V Balaji and Madhuri S Balaji[20], conducted a prospective screening for GDM in the urban (Chennai city), semi urban (Saidapet taluk) and rural (Thiruvallur district) areas. It included 4151, 3960 and 3945 pregnant women in the urban, semi urban and rural areas respectively and they underwent a 75 grams glucose challenge test in the fasting state irrespective of their gestational age. Diagnosis of GDM was made if the 2 hr plasma glucose was ≥ 140 mg/dl (WHO criteria). 1679 patients (16.55%) were detected to have GDM. The prevalence of GDM in the urban, semi urban and rural area was 739 (17.8%), 548 (13.8%) and 392 (9.9%) respectively. The prevalence of GDM was significantly lower in the rural area ($p<.0001$) when compared to other areas. GDM was diagnosed in 1204 (72%) pregnant women in the first visit and the remaining 475 (28%) in the subsequent visits. In this study among the GDM women from all the three areas, 12.4% were detected within 16 weeks, 23% between 17 and 23 weeks and remaining 64.6% more than 24 weeks of gestation. There was a significant increase in the prevalence of GDM as the age and BMI increased. The prevalence of GDM in the physically inactive group was found to be 19.1%, 16.6% and 12.1% whereas it was 17.6%, 12.8% and 9.7% in the physically active group. Positive family history of diabetes was present in 25%. On univariate analysis, they observed in all the three areas, that age ≥ 25 yrs, BMI ≥ 25kg/sq.m and family history of diabetes were significantly associated with the prevalence of GDM.

Umesh Dashora and Vandana Dashora[21] tested 564 patients attending the antenatal clinic of Ibra Regional Referral Hospital of Oman for glucose intolerance by glucose tolerance test using 75 grams glucose (WHO criteria). The test was performed at booking. If the results are normal, the test was repeated 2 or 3 times at 2 month intervals, the last being at the 7th month of pregnancy. They found that 21.3% of pregnant women had GDM – 1.1% had high fasting values (≥ 110mg/dl) and 20.2% had high post glucose values (≥ 140mg/dl). Over 88% of the patients with GDM were diagnosed before the 7th month of pregnancy. 10% of women required a second test and 2.5% were diagnosed only at the third test. Birth weight of the children in the GDM group was 3.13 kg compared with 2.9 kg in the non diabetic group. Hence early and multiple screening for GDM has the potential to increase detection of GDM and to favorably influence pregnancy outcome.

V Seshiah and A Cynthia[22], undertook a study to assess the merits of care given to women in whom GDM was diagnosed in different weeks of gestation and to find out the ideal period of screening in women with history of high risk pregnancies. A total of 207 pregnant women irrespective of the trimester referred for diabetes in pregnancy, underwent a 75 grams oral glucose challenge test and GDM was diagnosed if 2 hr plasma glucose ≥ 140 mg/dl. A_1C was estimated in all of

them. Women who failed to respond to medical nutrition therapy were advised insulin and the dose titrated to maintain fasting plasma glucose < 90mg/dl and 2 hr plasma glucose < 120 mg/dl.

Among them, 87 were diagnosed as GDM. The gestational week at diagnosis was ≤ 12 in 41.4% women (group 1), between 13 and 23 in 20.7% (group 2), between 24 and 30 in 17.2% (group 3) and beyond 30 weeks of gestation in 20.7% (group 4). The birth weight of babies born to women with normal glucose tolerance was 3.28 ± 0.5 kg. The birth weight of babies born to GDM women in group 1, group 2, group 3 and group 4 was 3.15, 3.09, 3.32 and 3.51 respectively. Group 1 women in spite of the history of high risk pregnancies, delivered babies appropriate for gestational age like normal glucose tolerance women. Screening in the first trimester of pregnancy and institution of therapy is advisable in women with high risk pregnancies.

OVERVIEW OF DIABATES IN PREGNANCY

OVERVIEW OF DIABATES IN PREGNANCY

DEFINITION OF GESTATIONAL DIABETES:

Carbohydrate intolerance of variable severity with onset or first recognition during the present pregnancy. Pregnancy is a form of stress that can cause latent diabetes to manifest. In most of these cases the carbohydrate intolerance will revert by the end of puerperium but this manifestation may be the first indication of diabetes yet to come.

CLASSIFICATION OF DIABETES DURING PREGNANCY

Diabetes mellitus has been classified recently by the **American Diabetes Association** (ADA) on the basis of etiology into the following categories.

Type 1 diabetes mellitus	: Immune mediated DM
	: Idiopathic DM
Type 2 diabetes mellitus	: Relative rather than absolute insulin deficiency

Impaired glucose homeostasis : Impaired fasting glucose

: Impaired glucose tolerance

Gestational diabetes mellitus : Glucose intolerance in pregnancy

Other specific types : DM due to specific etiologies

- Genetic defects of beta cell function
- Genetic defects of insulin action
- Disease of exocrine pancreas
- Endocrinopathies
- Drug or chemical induced
- Infection
- Uncommon forms of immune related diabetes
- Other genetic syndromes

Type 1 diabetes mellitus

It is also called as insulin dependent diabetes mellitus or juvenile diabetes. It is due to cell mediated immune destruction of beta cells of pancreas or can be of unknown etiology. There is an HLA association, gene being located on chromosome 6.

Type 2 diabetes mellitus

It is also called as non insulin dependent diabetes mellitus or maturity onset diabetes. It is due to an abnormality in insulin secretion and peripheral insulin resistance. Most of the patients are obese. There is no HLA association, but there is a strong familial occurrence.

Impaired glucose homeostasis

Impaired fasting glucose – fasting glucose is higher than normal, but less than diagnostic. Impaired glucose tolerance – plasma glucose following a 75grams challenge is higher than normal, but less than diagnostic.

GESTATIONAL DIABETES MELLITES – EPIDEMIOLOGY

Incidence

It is variously estimated that 3 to 5 % of pregnancies are complicated by diabetes. Approximately 0.2 to 0.5 % of all pregnancies occur in women with a preexisting diagnosis of type 1 diabetes and a similar number have preexisting type 2 diabetes mellitus. An additional 1 to 6 % of women will develop sufficient hyperglycemia during pregnancy to meet the criteria for a diagnosis of gestational

diabetes. Of those women with GDM, 20 and 50% will subsequently develop diabetes mellitus.

Criteria for diagnosis of GDM

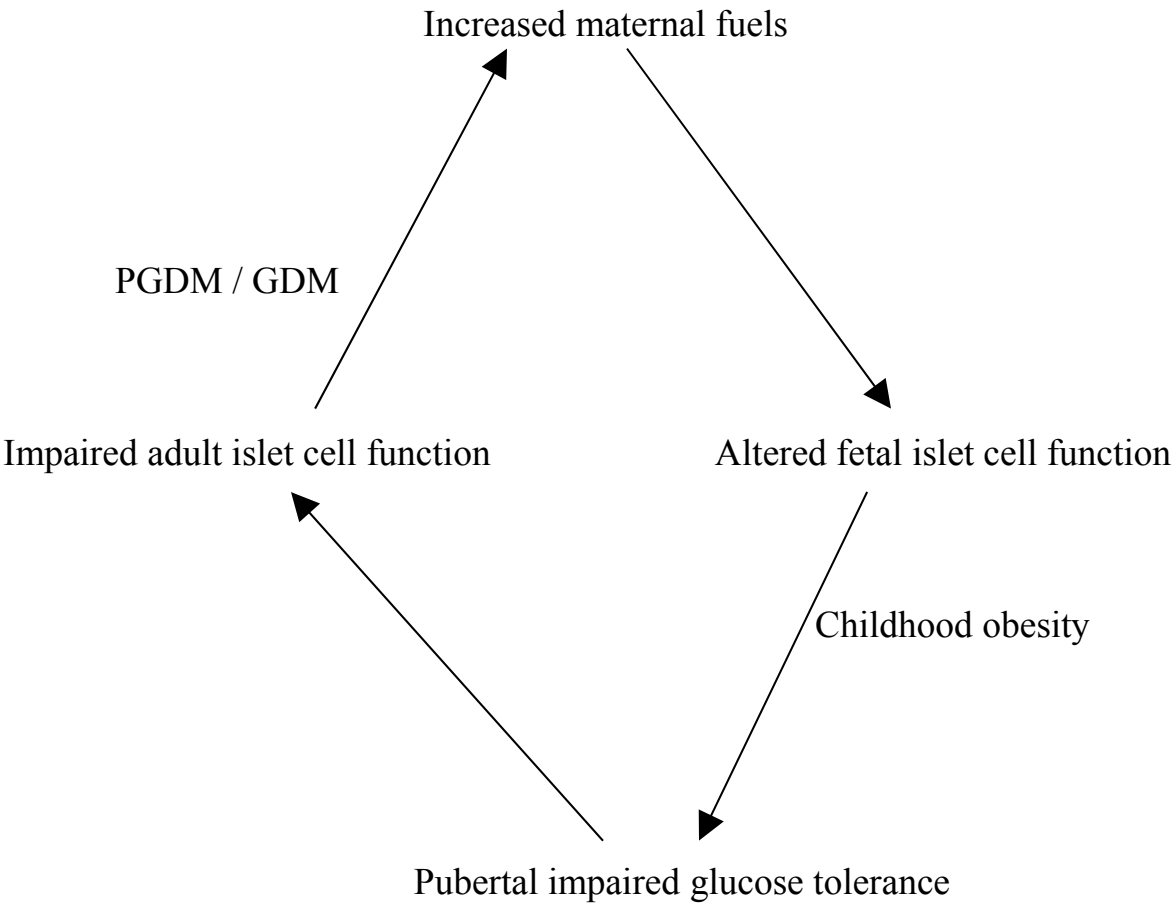
Care must be taken not to over diagnose maternal diabetes. It is preferable to describe women with abnormal screening test as having impaired glucose tolerance during pregnancy or gestational carbohydrate intolerance, rather than using the term diabetes, since final definition depends upon re-evaluation 6 to 12 wks post partum.

Maternal influences

Detailed studies of many GDM subjects have disclosed considerable phenotypic and genotypic heterogeneity. Obesity and advanced maternal age increase the risk of GDM. GDM is commonly regarded as a forerunner of NIDDM. Maternal transmission of diabetes that is linked to mutations in mitochondrial DNA has been described and increased occurrence of HLA antigen DR3 and DR4 associated with GDM has been found.

Freinkel formulated the hypothesis of “Fuel mediated teratogenesis “, which states that maternal fuels may influence development of the fetus by modifying phenotypic gene expressions. The risk of development of NIDDM is greater if

mother had diabetes during pregnancy. Predisposition to childhood obesity and impaired glucose tolerance is linked to prenatal metabolic factors. The chain of events is depicted as,



This suggests that diabetes can predispose to more diabetes. However this process is potentially preventable by more effectively normalizing metabolism throughout the gestation in pre gestational diabetes and early diagnosis and correction of the metabolic disturbances of gestational diabetes mellitus.

Metabolic changes during normal and diabetic pregnancy

The metabolic demands of the developing fetus dictate the maternal metabolism with minimal catabolism during fasting which appears to be mediated by hormones secreted from the fetoplacental unit. The three most prominent changes are progressive insulin resistance, accelerated fat catabolism and fasting hypoglycemia. Longitudinal studies in women who have normal glucose tolerance have shown significant progressive alterations in all aspects of glucose metabolism as early as the end of the first trimester.

Insulin secretion from pancreatic beta cells normally modulates this impact. Insulin secretion progressively increases in response to an intravenous glucose challenge with advancing gestation. The increases in insulin concentration are more pronounced in lean than in obese women. Because insulin demands increase during pregnancy, women with overt or incipient diabetes are not able to make sufficient insulin to modulate normally the metabolic impact of the fetus and placenta.

When in fed state, there is “facilitated anabolism”, which is characterized by prolonged hyperglycemia in the mother. Along with the facilitated action of insulin, there is also an increased level of prolactin and cortisol that result in insulin resistance.

The mild postprandial hyperglycemia, serves to increase the amount of time that glucose levels are elevated above the basal levels, after a meal, thereby increasing the flux of ingested nutrients from mother to fetus and enhancing fetal anabolism. The physiologic changes responsible for the insulin resistance of pregnancy appear to be related to the metabolic effects of several hormones which include Human placental lactogen, Progesterone, Prolactin and Cortisol.

THE DIABETOGENIC POTENCY OF HORMONES IN PREGNANCY

HORMONE	**PEAK ELEVATION (weeks)**	**DIABETOGENIC POTENCY**
Prolactin	10	Weak
Estradiol	26	Very weak
Human chorionic somato mammotropin	26	Moderate

Cortisol	26	Very strong
Progesterone	32	Strong

The metabolic changes that occur during fasting in pregnant women have been referred to as “accelerated starvation”, which include a reduction in circulating glucose concentration, accelerated lipolysis and ketogenesis.

Women who develop GDM are more insulin resistant than normal women. Two types of insulin resistance are seen in pregnancy.

1. The reversible insulin resistance that occur in all pregnancies.
2. The less severe chronic insulin resistance that occur in women who are at risk of NIDDM.

Because insulin demands increase during pregnancy, women with limited beta cell secretary reserve are not able to synthesize sufficient insulin to modulate normally the metabolic impact of the fetus and placenta. As a result, these women develop significant and predictable metabolic abnormalities of intermediary metabolism that can threaten maternal and fetal well being.

Pregnancy may disclose glucose intolerance without any clinical symptoms in a predisposed woman. In population with prevalence of diabetes like the Nomi population, still birth will occur for 90% in the diabetic population disregarding the level of postprandial blood sugar. Hence the clinical importance of even minor elevation of maternal blood sugar which is associated with still births and macrosomia.

Typical macrosomic baby

SCREENING TESTS FOR GESTATIONAL DIABETES MELLITES

Numerous methods of screening for GDM have been used. An ideal screening test must be simple, easily administered, well defined, inexpensive and reproducible. It should have high sensitivity. It need not have high specificity that is demanded of a diagnostic test.

Tests for carbohydrate intolerance during pregnancy

1. Simple screening tests
    a) Fasting plasma glucose >105 mg/dl
    b) 2hr postprandial / random plasma glucose > 120 mg/dl
2. Recommended loading tests for screening
    a) 50gms glucose challenge test, 1st hr value > 140 mg/dl
    b) 100gms, 3hrs, oral glucose tolerance test
    c) 75gms glucose challenge test, 2nd hr value > 140 mg/dl – also diagnostic

Glucosuria as screening test in pregnancy

Glucosuria is a commonly employed screening test for the detection of glucose intolerance. But during pregnancy, the renal threshold for glucose is often lowered partly to an eight fold increase in glomerular filtration rate of glucose and partly to an intermittent tubular defect in glucose reabsorption.

This has lead to the observation of Long and Hint (1923), that glucosuria following an oral glucose load in a woman who has missed her period, can be used as a test for pregnancy. An awareness of this fact can lead to an under diagnosis of glucose intolerance during pregnancy, while a lack of it, will result in over diagnosis.

An analysis by V. Seshiah et al in 1986, on 342 pregnant women, revealed that, fasting glucosuria has 31.58% sensitivity, 78.95% specificity and 23.08% positive predictive value. Post glucose load glucosuria has 71.93% sensitivity, 64.56% specificity and 28.87% positive predictive value.

Detection of glucose in urine is the simplest screening procedure. Unfortunately, glocosuria is less specific as a screening test, besides being a poor guide to diabetic control during pregnancy.

Fasting and random glucose studies as screening tests

Glucose values obtained without a glucose challenge have been investigated as screening tests. Such tests, if workable, would have the advantage of avoiding the administration of glucose solution. Plasma glucose concentration after an over night fast was approximately 10mg/dl lower in pregnant women and glucose falls by an additional 8 to 10mg/dl in pregnant but not in non pregnant women, when both groups postponed breakfast for 6hrs. When the fasting plasma glucose value is >105mg/dl, it suggests glucose intolerance.

WHO Test:

According to WHO expert committee, 75 grams oral glucose load is given (Patient need not be in fasting) and a single plasma glucose value estimation at 2 hours if more than 140 mg/dl a 3 hour OGTT is performed. The ministry of health, Govt. of Tamilnadu has suggested the WHO recommendation for universal screening in Tamilnadu, which serves both as one step screening and diagnostic procedure, easy to perform and also being economical.

Glucose Polymer Challenge Test:

Glucose polymer is an inexpensive commercially available glucose saccharide mixture containing 3% glucose, 7% maltose, 55% maltotriose and 85% polysaccharides. Its osmotic load is one fifth that of glucose and has been reported to be associated with less gastro intestinal symptoms. A moderate level of agreement between the results and 3 hour OGTT has also been demonstrated.

Glycated Blood Proteins in the diagnosis of GDM:

Glycated hemoglobin and other proteins have been investigated as screening tests for GDM. Glycation is slow and almost irreversible binding of glucose or a phosphorylated sugar to hemoglobin or other blood proteins. Because it is dependent on the concentration of reactants and because the RBC concentration of glucose approximates that in extra cellular fluid glycated hemoglobin has been investigated as a diagnostic test for non gestational diabetes.

Drawbacks:

GDM however may not be present with the same constant elevation of blood sugar levels as in non pregnant state. Gravid women with GDM have fasting blood glucose concentration that are low, because of increased erythropoiesis, RBCs are younger in pregnancy, hemoglobin is less glycated and hormonal milieu changing rapidly from relative insulin sensitivity to that of insulin resistance as the pregnancy

advances, a measure of chronic hyperglycemia such as glycated hemoglobin may not be effective in GDM.

DIAGNOSTIC TESTS FOR GESTATIONAL DIABETES MELLITES

Oral glucose tolerance test

Women who screen positive with glucose challenge test are subjected to a 3 hour oral glucose tolerance test (OGTT). It should be started in the morning after an overnight fasting of at least 8 hrs but no more than 14 hrs, following at least 3 days of unrestricted diet (≥ 150 grams of carbohydrate) and physical activity. Venous plasma glucose is measured at fasting and at 1, 2 & 3 hours after a 100 grams glucose load. Subjects should remain seated and should not smoke tobacco. Carpenter and Couston criteria is then applied.

AIM OF THIS STUDY

AIM OF THIS STUDY

AIM OF THIS STUDY:

This study compares the efficacy of 75 grams glucose challenge test with fasting and postprandial blood glucose values in the screening of gestational diabetes mellitus in the general population.

MATERIALS AND METHODS

MATERIALS AND METHODS

SETTINGS:

The study was conducted in the high risk unit of the antenatal clinic outpatient department of the Institute of Social Obstetrics & Govt. Kasturba Gandhi Hospital for Women and Children, Triplicane, Chennai.

STUDY GROUP:

The study group included 300 pregnant women in GCT group and 300 pregnant women in fasting & post prandial group. The group allotment was random. They have been followed up from the time of confirmation of pregnancy through delivery until one week post partum. GDM patients were followed up to 6 weeks post partum at which time OGTT was done to find out their glycemic status.

DURATION OF STUDY:

September 2008 to August 2009.

INCLUSION CRITERIA:

Women with singleton gestation

Women with no past history of GDM / DM

Not on any long term treatment for other medical illness

No previous history of treatment for GDM/DM including on meal plan

EXCLUSION CRITERIA:

Women with diabetes mellitus

Women with multiple gestation

Women with other risk factors like anemia, heart disease, epilepsy, thyroid disorders, bad obstetric history, jaundice and auto immune disorders.

Women with past history of GDM

Those on long term medical treatment for any illness

SCREENING METHODOLOGY:

- **GCT group**:

75grams glucose was administered to women allotted to the GCT group, irrespective of the last meal. Plasma glucose is estimated after two hours from a venous blood sample using glucose oxidase – peroxidase (GOD-POD) method. The

test was considered to be positive when the plasma glucose values were ≥ 140mg% after 2 hours of glucose administration (WHO criteria).

- **FASTING / POSTPRANDIAL group:**

In women allotted to the fasting and post prandial group, fasting blood glucose and post prandial plasma glucose values were taken. The fasting value of ≥ 95 mg% after an overnight fasting and a post postprandial value of ≥ 140 mg% at the end of 2 hours after meal were considered to be abnormal.

GCT and fasting & post prandial plasma glucose testing was done in the pregnant women allotted to the respective groups during 4 visits.

1st visit – 8 to 10 wks

2nd visit – 16 to 20 wks

3rd visit – 24 to 28 wks

4th visit – 32 to 36 wks

When they test positive, they were considered to have GDM and were treated. Either put on meal plan or given insulin as per their glucose values.

RESULTS AND ANALYSIS

RESULTS AND ANALYSIS

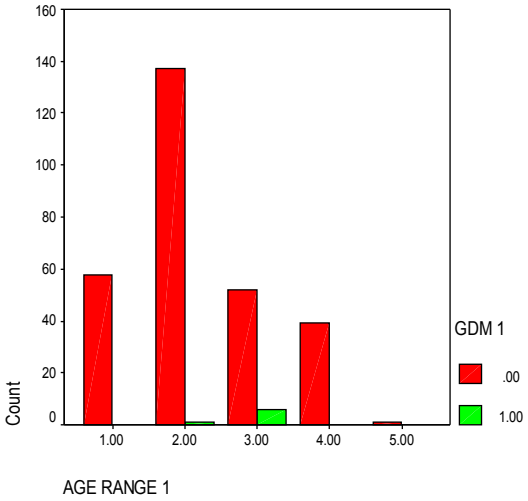
This study commenced with 300 women in each group out of which 6 in each group could not be followed up. This has reduced the total number of test subjects to 294 women in each group.

AGE DISTRIBUTION:

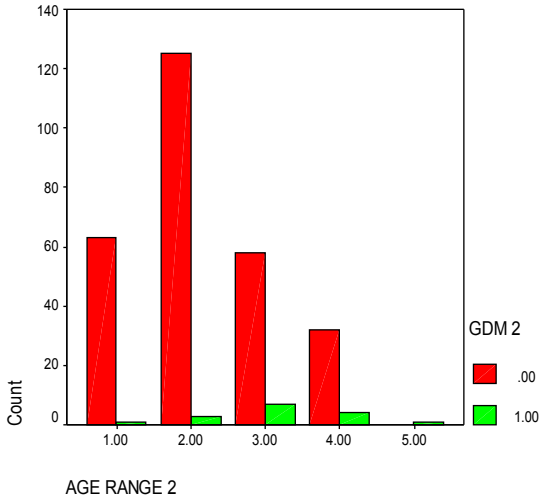
Table 1:

Age group	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
16 to 20 yrs	1	58	0	58	63	1	64
21 to 25 yrs	2	137	1	138	125	3	128
26 to 30 yrs	3	52	6	58	58	7	65
31 to 35 yrs	4	39	0	39	32	4	36
36 to 40 yrs	5	1	0	1	0	1	1
Total		287	7	294	278	16	294

FBS / PPBS group



GCT group



The mean age of the pregnant women screened was and 24.2 ± 4.5 yrs in FBS / PPBS group (group 1) and 24.3 ± 4.5 yrs in GCT group (group 2). The distribution of women in the age group 21 to 25 yrs was relatively higher in both the groups (46.6% in group 1 & 42.5% in group 2). The prevalence of GDM across the age group of women in group 1 was ranging from 14.3 to 85.7% and that in group 2 was from 6.3 to 43.8%. Highest prevalence was observed in the age group of 26 to 30 yrs in both the groups. In both groups, age was a significant parameter ($p<0.001$).

BMI DISTRIBUTION:

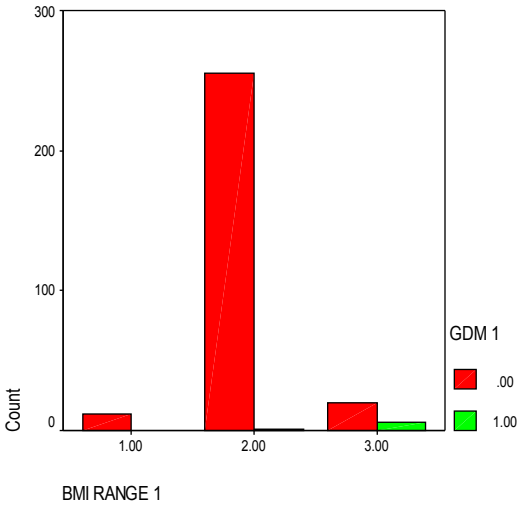
There was a consistent increase in the prevalence of GDM as BMI increased in both the groups and the trend was statistically significant ($p < 0.001$). Among the

GDM women, the highest prevalence was observed in women with BMI ≥ 26 kg/m^2 and it was 87.5% in group 1 and 56.3% in group 2.

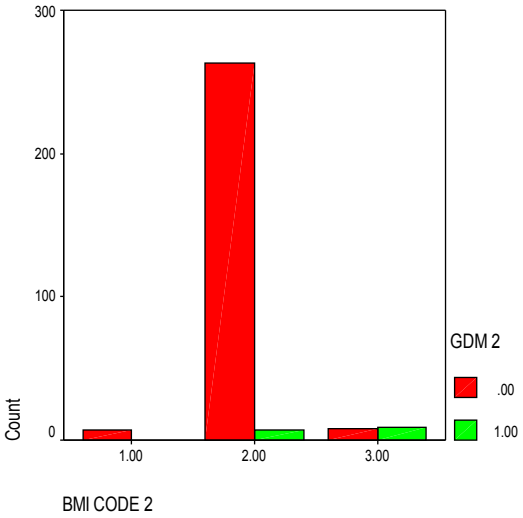
Table 2:

BMI range	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
< 18 kg/m^2	1	12	0	12	7	0	7
18 to 25 kg/m^2	2	255	1	256	263	7	270
>25 kg/m^2	3	20	6	26	8	9	17
Total		287	7	294	278	16	294

FBS / PPBS group



GCT group

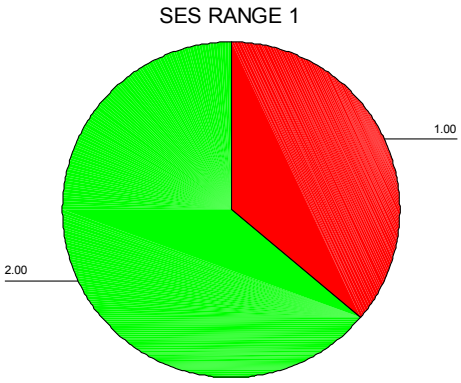


SOCIO ECONOMIC STATUS:

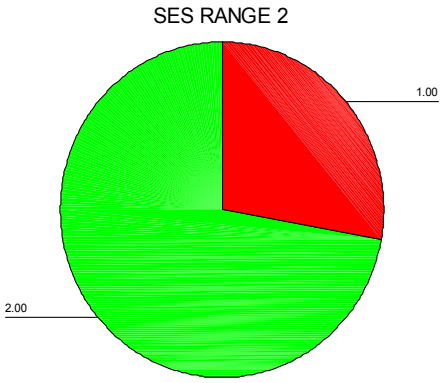
Table 3:

Socioeconomic status	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Class 4	1	100	6	106	70	12	82
Class 5	2	187	1	188	208	4	212
Total		287	7	294	278	16	294

FBS / PPBS group



GCT group



In both these groups, GDM prevalence was significantly increased in women belonging to class 4 socio economic status (85.7% in group 1 and 75% in group 2).

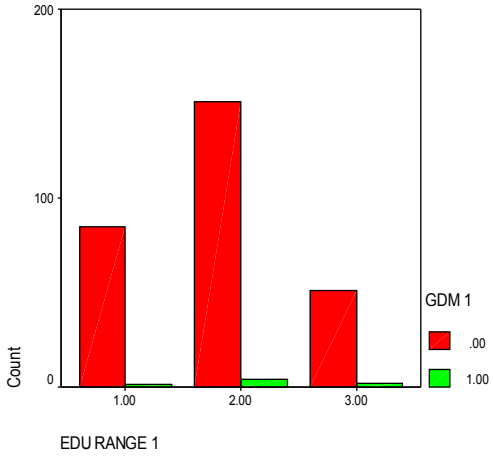
EDUCATIONAL STATUS:

The prevalence of GDM was high in women with higher secondary education. This is because much of women visiting ISO & KGH belong to this category.

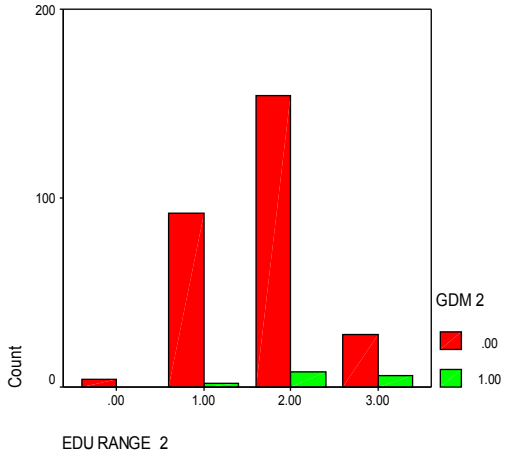
Table 4:

Educational status	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Uneducated	0	0	0	0	4	0	4
Primary & high school	1	85	1	86	92	2	94
Higher secondary	2	151	4	155	154	8	162
Degree	3	51	2	53	28	6	34
Total		287	7	294	278	16	294

FBS / PPBS group



GCT group



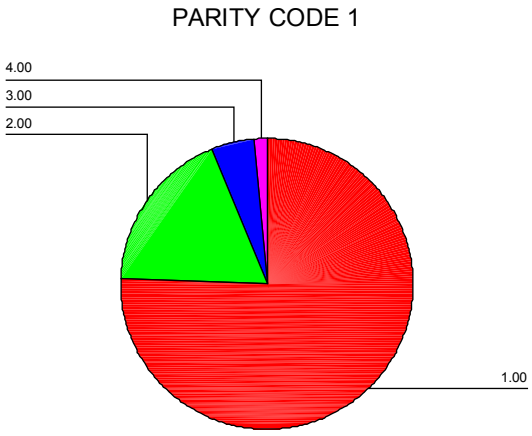
PARITY:

Since the distribution of primi was more, the prevalence of GDM was also more in them.

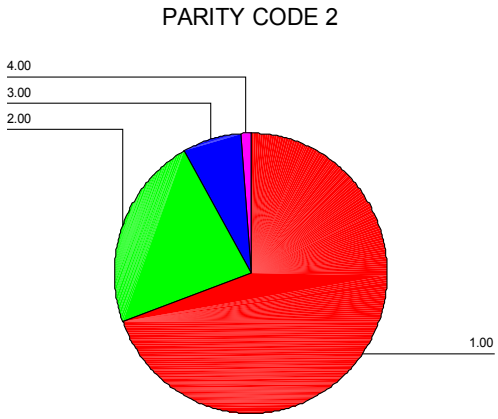
Table 5:

Parity	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Primi	1	218	4	222	196	8	204
2nd gravida	2	51	3	54	60	6	66
3rd gravida	3	14	0	14	20	1	21
4th gravida	4	4	0	4	2	1	3
Total		287	7	294	278	16	294

FBS / PPBS group



GCT group



TIME OF DIAGNOSIS:

Table 6:

GDM DIAGNOSED AT	FBS/PPBS group			GCT group		
	No. of cases	%	% of GDM	No. of cases	%	% of GDM
First visit (8 – 10 wks)	0	0	0	1	0.3	6.3
Second visit (16 – 20 wks)	0	0	0	3	1	18.7
Third visit (24 – 28 wks)	4	1.4	57.1	8	2.7	50

Fourth visit (32 – 36 wks)	3	1	42.9	4	1.4	25
Total no. of cases	7	2.4	100	16	5.4	100

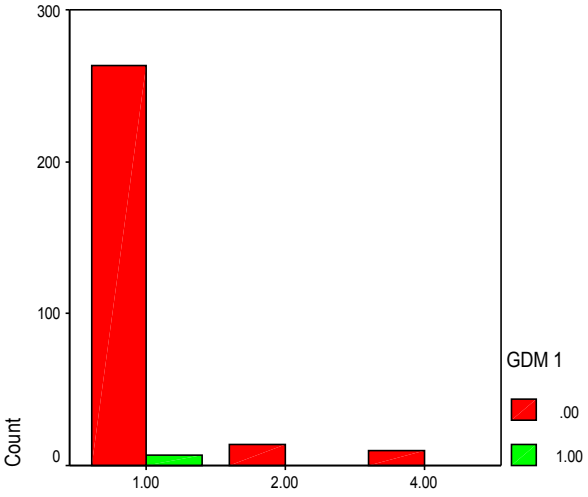
Hence more pregnant women were diagnosed as GDM during the third visit in both the groups. In GCT group, 6.3% of cases were diagnosed at 1st visit and 18.8% at 2nd visit. This indicates a necessity for earlier screening and appropriate diagnosis and management in order to prevent or minimize adverse perinatal outcomes.

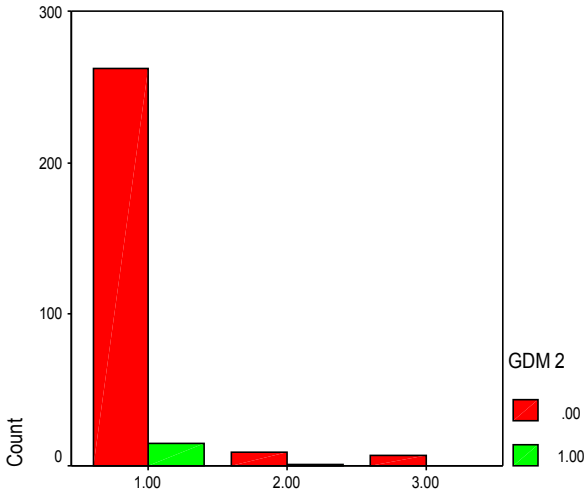
GESTATIONAL AGE AT DELIVERY:

Table 7:

GESTATIONAL AGE	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Term	1	263	7	270	262	15	277
Preterm	2	14	0	14	9	1	10
Post dated	3	10	0	10	7	0	7
Total no. of cases		287	7	294	278	16	294

FBS / PPBS group GCT group





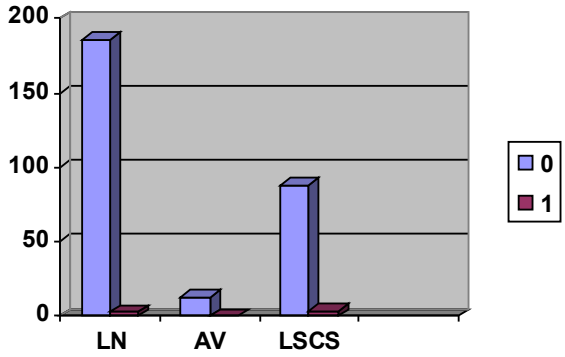
Most of the women with GDM delivered at term in both the groups. There was one preterm in GDM women of GCT group. This is due to premature rupture of membranes leading to preterm labour.

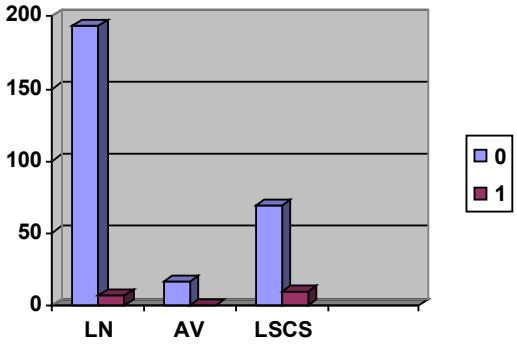
TYPE OF DELIVERY:

Table 8:

TYPE OF DELIVERY	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Labour natural	1	186	3	189	193	7	200
Assisted vaginal	2	13	0	13	16	0	16
Caesarean section	3	88	4	92	69	9	78
Total		287	7	294	278	16	294

FBS/PPBS group GCT group





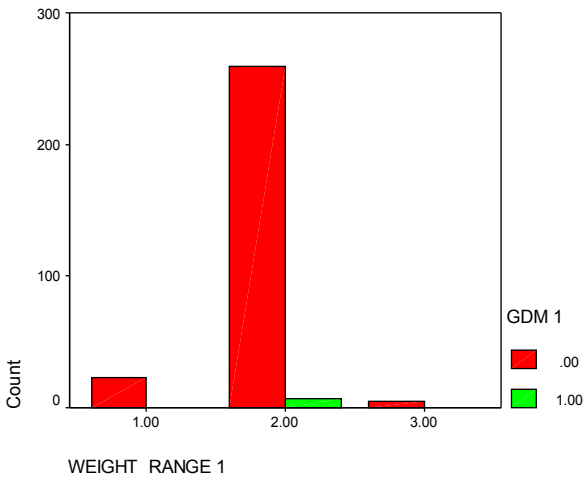
The total caesarean delivery rate was 31.29% in group 1 and 26.53% in group 2. This might be due to the higher number of previous caesarean rates. There were 61 women with previous caesarean in group 1 and 65 women in group 2.

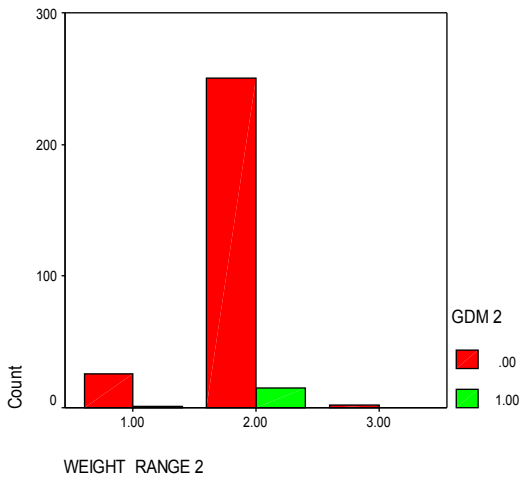
BIRTH WEIGHT:

Table 9:

Range of weight	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
< 2.5 kg	1	23	0	23	26	1	27
2.5 to 4 kg	2	259	7	266	250	15	265
> 4 kg	3	5	0	5	2	0	2
Total		287	7	294	278	16	294

FBS/PPBS group GCT group





The mean birth weight of babies in FBS / PPBS group was 3.01 kg and that of babies in GCT group was 2.93 kg. There were 5 cases of macrosomic babies in the non GDM women of group 1. Hence for the last 100 women of group 1, GCT was done at 28 wks. The sensitivity of FBS / PPBS testing was found to be only 60%.

Since most of our women come from economically weaker sections of the society, the birth weight also is somewhat lower than the average birth weight. Hence there is more number of babies with birth weight <2.5 Kg.

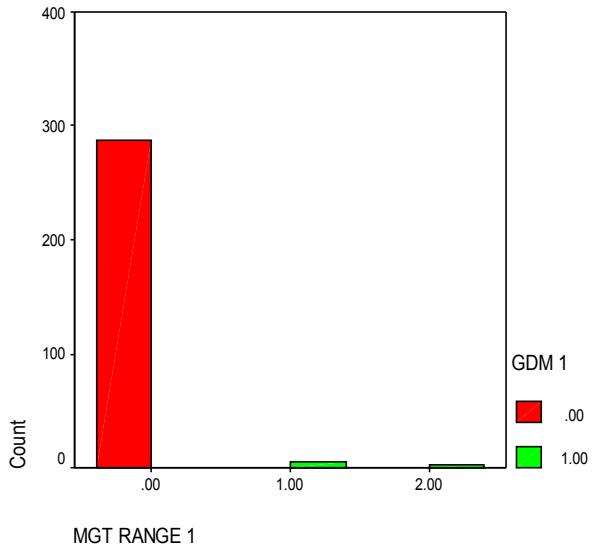
MANAGEMENT:

Out of the 7 GDM patients in group 1, 5 were on meal plan and 2 were put on insulin. Out of the 16 GDM patients in group 2, 10 were on meal plan and 6 were put on insulin.

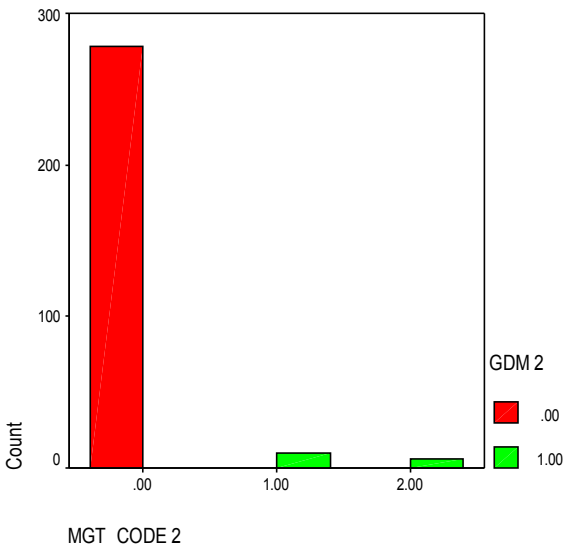
Table 10:

Management	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
No treatment	0	287	0	287	278	0	278
Meal plan	1	0	5	5	0	10	10
Insulin	2	0	2	2	0	6	6
Total		287	7	294	278	16	294

FBS/PPBS group



GCT group



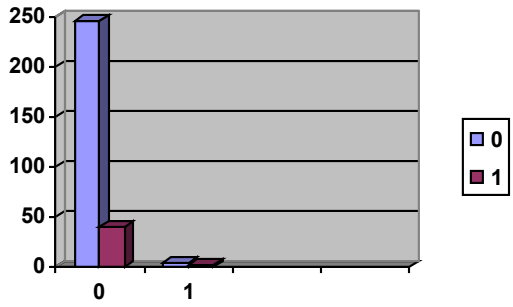
NEONATAL ADMISSION:

Table 11:

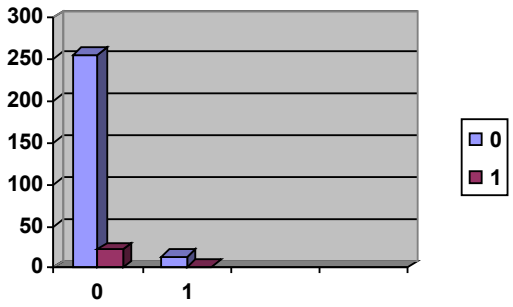
Admission status	Legend	FBS/PPBS group			GCT group		
		No GDM	GDM	Total	No GDM	GDM	Total
Not admitted	0	246	4	250	255	14	269
Admitted	1	41	3	44	23	2	25

Total		287	7	294	278	16	294

FBS/PPBS group



GCT group



The reasons for admission were preterm, low birth weight, sepsis, transient tachypnea of new born, hyperbillirubinemia, respiratory distress syndrome, meconium aspiration, birth asphyxia and hypoglycemia. There were 8 cases of hypoglycemia in group 1 and 2 cases in group 2. Plasma glucose levels were tested in all the babies of GDM mothers and if found to be normal, the babies were handed over to the mother with instructions to start early breast feed.

FINDINGS ON FOLLOW UP:

There were 2 patients with LSCS wound infection and 1 patient with episiotomy wound gaping in group 1 women who did not have GDM.

In both the groups, GDM patients had normal plasma glucose levels on follow up. Only one woman in Group 2 continued to have increased levels of blood glucose even after 6 weeks and she is being managed appropriately.

DISCUSSION

DISCUSSION

Gestational diabetes mellitus (GDM) is the most common medical complication of pregnancy. GDM occurs in women who have insulin resistance and a relative impairment of insulin secretion. These women have a significant risk of developing diabetes later in life. Identifying this group of women is important in not only preventing perinatal morbidity but also improving long-term outcomes for the mothers and their children.

Proponents of universal screening for GDM emphasize that pregnancy provides a unique opportunity to diagnose a disease that has significant short- and long-term implications for both mothers and children.

In the study group that includes 600 pregnant women, 300 women randomly allocated to undergo either a glucose challenge test or a fasting and post prandial plasma glucose estimation at different periods of gestation, mean age was 24.3 +/-

4.5 yrs, mean BMI was 21.95 +/- 2.5 kg/m^2, 70.4% were primigravida and 29.6% were multigravida. The results of the present study are compared with the results of various other published studies.

Comparison of the prevalence of GDM:

The prevalence of GDM ranges between 1–14% of patients, depending on the population described and the criteria used for diagnosis. The prevalence of GDM was 2.4% in the fasting post prandial group. It has identified 7 cases of GDM among the 300 pregnant women allotted to the fasting & post prandial group (group 1).

The prevalence of GDM was 5.4% in the GCT group. It has identified 16 cases of GDM among the 300 pregnant women allotted to the GCT group (group 2).

Prevalence of GDM

Author	Location	Prevalence (%)
Abell, Beischer[27]	Australia	0.7
Beischer[28]	India	15
Ranchod[29]	India	3.8
O'Sullivan[30]	Boston	2.5
Magee[31]	Seattle	3.2–5.0
Dooley[32]	Chicago	3.5–5.5
Sacks[33]	Los Angeles	3.4
Berkowitz[34]	Manhattan	4.6
Murphy[35]	Alaska	5.8
Nahum[36]	Los Angeles	7.1
Mestman[37]	Los Angeles	12.3
Benjamin[38]	Zuni, New Mexico	14.3
Present study		**5.4**

Age distribution:

In the present study, the mean age of patients without GDM was 24.15 ± 4.5 yrs and that of those with GDM was 26.76 ± 4.4 yrs.

Author	Mean age of pts. without GDM	Mean age of pts. with GDM	p value
RUN MEI MA et al[39]	28.4 - 3.6 yrs	29.6 - 4.0 yrs	< 0.001

BMI distribution:

Shin Y. Kim et al[40], reported the proportions of gestational diabetes cases attributable to overweight, obesity, and extreme obesity were 15.4%, 9.7%, and 21.1%, for a total of 46.2%. "In other words, if all women with a BMI of 25 or greater had a GDM risk equal to that of women in the normal BMI category, nearly half of GDM cases could be prevented. Lifestyle interventions to reduce BMI have the potential to lower GDM risk," she commented. According to Ogonowski and Miazgowski et al[41], the cut off point for BMI as a risk indicator for GDM was 22.85kg/m^2 (odds ratio = 1.91; 95% confidence interval 1.5-2.1; sensitivity 47.8%, specificity 65.9%). Significant relationships between pregravid BMI and GDM were found and BMI was the strongest predictor for GDM treated with insulin. In our study, the mean BMI of patients with GDM was 26.02 kg/m^2 and for those without GDM was 21.75 kg/m^2.

Socio economic status:

Socioeconomic status was inversely associated with risk of GDM. The risk of GDM was approximately two-thirds higher in women living in the lowest socioeconomic postcodes compared with women in the highest group. The inverse relationship between socioeconomic status and risk of GDM was apparent across all ethnic groups when data were stratified by maternal region of birth, with women in the bottom half of SEIFA postcodes having at least a 30% higher risk of GDM relative to that for the highest quartile. Women in the lowest socioeconomic group aged >40 years had a risk of 10.26 (95% CI 8.75–12.03) compared with that of women aged 20–24 years residing the highest quartile of SEIFA postcodes in the study conducted by Vibeke Anna et al[42].

According to Timothy D. Dye et al[43], women of higher socioeconomic status who were obese and did not exercise were at a significantly elevated risk of GDM compared with their counterparts of lower socioeconomic status. In this study, the incidence of GDM was high in women belonging to class 4 socio economic status in both groups (85.7% in group 1 & 75% in group 2).

Educational status:

The prevalence of GDM ranged from 1.05% (95% CI - 0.60, 1.70) in the less educated to 2.10% (95%, CI 1.34, 3.13), in the more educated neighborhood according to M. Janghorbani et al[44]. In this study, 1.4% of patients with higher secondary education and 0.7% of patients with some graduation had GDM in group 1 and similarly 2.7% and 2% in group 2 had GDM.

Parity:

According to D. Simmons et al[45], GDM was less common among women with a parity of 1 to 2 (OR = 0.64) and 3 to 4 (OR = 0.72) than in grand multiparous women. Vibeke Anna et al found women who had reported a previous pregnancy of > 20 weeks' gestation had a small but significantly reduced risk of GDM in subsequent pregnancies. There was nearly a 10% reduction in risk in women who had a previous pregnancy compared with that in women having their first pregnancy. A similar small protective effect was also apparent among women who had two or more previous pregnancies. In our study, 57.1% of GDM was in Primigravidas in group 1 and 50% in group 2.

Time of diagnosis:

According to Seshiah et al, among the GDM women detected in his study, 35.4% were < 24 weeks of gestation and this included 12.4% of GDM women < 16 weeks of gestation and remaining 64.6 % more than 24 weeks of gestation. 2-2.5 per cent of the gestational diabetes prevalence recorded during the Tamil Nadu programme was found in the 16th week, while 2.5-3 per cent cases were detected during the 24th week and around 3 per cent in the 32nd week by Seshiah et al in the Background paper for the Guidelines for GDM Screening in Tamil Nadu[46]. In our study, the GDM prevalence at <24 wks was 25.1%, at 24 wks was 50% and that at >32 wks was 25%. Hence early screening for glucose intolerance and care is likely to result in the reduction of some of the hyperglycemia-related complications.

Gestational age at delivery:

Yariv Yogev et al[47] found no difference in the rate of spontaneous preterm delivery (sPTD) in GDM (163/1,526, 10.7%) in comparison to non-GDM patients (1193/10,560, 11.3%, P = 0.2). GDM patients with sPTD were characterized by higher glucose values in the OGTT and higher mean blood glucose (114 ± 16 vs. 106 ± 14, P < 0.0001). In our study, nearly all patients with GDM delivered at term.

Birth weight:

According to R G Moses et al[48], for women with GDM, the mean (± 1 SD) birth weight was 3293 ± 493 g. Their values were not significantly different from the matched group, which had a birth weight of 3315 ± 460 g. In our study, the mean birth weight of IDM babies was 3.10 and those of normal women was 3.01 ± 0.5 kg in group 1 and that in group 2 was 2.99 and 2.92 ± 0.4 kg respectively.

Intrapartum and neonatal characteristics:

According to Jana Kaida Silva et al[49], statistically significant differences in type of delivery, neonatal weight / macrosomia, hypoglycemia, and hyperbilirubinemia were found among ethnic groups. Neonates born to Native -Hawaiian / Pacific - Islander and Caucasian women were more likely to have hypoglycemia whereas neonates born to Native – Hawaiian / Pacific - Islander, Filipino, and Caucasian women were more likely to have hyperbilirubinemia than neonates from other ethnic groups. Native – Hawaiian / Pacific - Islander women were also more likely to have neonates with macrosomia than women from the other ethnic groups. Chinese women were more likely to have assisted vaginal delivery (vacuum extraction or forceps) but were least likely to have had cesarean section compared with women from the other ethnic groups.

In our study, there were no assisted vaginal deliveries in both groups, whereas, 57.2% of GDM patients delivered by caesarean and 42.8% by labour natural in group 1 and 56.2% and 43.75% in group 2. 42.9% of infants of diabetic mother were admitted in group 1 and the same in group 2 was 12.5%.

SUMMARY

SUMMARY

This is a comparative study of the efficacy of 75 grams glucose challenge test with fasting and postprandial blood glucose values in the screening of gestational diabetes mellitus in the general population, carried out in the high risk unit of the antenatal clinic outpatient department of the Institute of Social Obstetrics & Govt. Kasturba Gandhi Hospital for Women and Children, Triplicane, Chennai.

The study group consisted of 600 apparently normal pregnant women, randomly allotted to FBS / PPBS or 75 grams GCT group, 300 each. The respective tests were done on 4 visits. 1st visit – 8 to 10 wks, 2nd visit – 16 to 20 wks, 3rd visit – 24 to 28 wks and 4th visit – 32 to 36 wks. Patients who have GDM were given appropriate treatment.

The prevalence of GDM was 2.4% in FBS / PPBS group and 5.4% in GCT group. GCT has identified 25% of cases prior to 24 weeks gestation, 50% of cases at between 24 to 28 weeks and 25% of cases after 32 weeks. Hence the earlier diagnosis allows better and effective management, thereby preventing adverse obstetric and perinatal outcomes. Also this is indicative that GDM reveals itself at all 3 trimesters.

The mean age of the pregnant women screened was 24.2 ± 4.5 yrs in FBS / PPBS group and 24.3 ± 4.5 yrs in GCT group. Highest prevalence of GDM was

observed in the age group of 26 to 30 yrs in both the groups. The pattern of significant increase in prevalence ($p < 0.001$) of GDM as the age increases was observed in both the groups.

Among the GDM women, the highest prevalence was observed in women with BMI $\geq$ 26 kg/m^2 and it was 87.5% in FBS / PPBS group and 56.3% in GCT group. Hence in both the groups, there was a significant ($p < 0.001$) increase in the risk of acquiring GDM as the BMI increases beyond 26.

The incidence of GDM was more in Primigravida. Higher prevalence was also noted in women belonging to class 4 socioeconomic status and in those with higher secondary education. They were managed with either meal plan or insulin according to their glucose levels.

Most of the patients with GDM delivered at term by labor natural or by caesarean section. There were no assisted vaginal deliveries in this group.

There was no significant difference in the birth weight of babies between normal women and in those with GDM in both groups. Hence for 100 patients in group 1, GCT was done at 28 weeks and the sensitivity of screening with fasting

and post prandial plasma glucose was only 60% when compared to screening with 75 grams glucose challenge test.

CONCLUSION

CONCLUSION

To conclude, 75 grams glucose challenge test done as per WHO criteria serves both as one step screening and diagnostic procedure, is easy to perform and also economical and has detected more number of GDM cases. The same has been recommended for screening in all pregnant women by "THE MINISTRY OF HEALTH and FAMILY WELFARE, GOVERNMENT OF TAMIL NADU".

SCREENING AND SUBSEQUENT TREATMENT STARTED IN THE EARLY WEEKS OF PREGNANCY HAS THE POTENTIAL TO DETECT CASES EARLY AND CAN PREVENT OR MINIMIZE ADVERSE OBSTETRIC AND PERINATAL OUTCOMES.

As the age increases, the risk of acquiring GDM also increases. Similarly when BMI is ≥ 26, GDM risk increases.

Screening with fasting and post prandial plasma glucose has only 60% sensitivity when compared to screening with 75 grams glucose challenge test.

Hence Glucose Challenge Test with 75 grams oral glucose irrespective of last meal for all pregnant women appear to be a simple, effective and easily reproducible screening method for early diagnosis of GDM.

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ANNEXURE

ANNEXURE

COMPARITIVE STUDY OF THE EFFICACY OF 75 GRAMS GLUCOSE CHALLENGE TEST WIYH FASTING AND POSTPRANDIAL BLOOD GLUCOSE VALUES IN THE SCREENING OF GESTATIONAL DIABETES MELLITUS IN THE GENERAL POPULATION

Name of patient :

Age :

OP No. :

Socio Economic Status : I II III IV V

Education :

Address :

Other risk factors : Present / Absent

Obstetric Formula :

BMI :

SCREENING FOR GDM

TEST	VISIT 1	VISIT 2	VISIT 3	VISIT 4
FBS / PPBS				

Or

TES	VISIT 1	VISIT 2	VISIT 3	VISIT 4

T				
GCT				

Management : Meal Plan

Drugs (Specify)

MATERNAL AND FETAL OUTCOME

- Delivered at : Term / Pre term / Post EDD
- Type of delivery : SVD / IVD/ CS
- Weight of the baby :
- Whether admitted in NICU : Yes / No
- Immediate follow up of the mother

MASTER CHART