Original Research Article

A Prospective Study of universal Screening of Hyperglycemia in Pregnancy During 1st Antenatal Visit

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Abstract

Background: Clinical recognition of GDM is a important because proper recognition and intervention can reduce the well described GDM associated perinatal morbidity and mortality. Study aimed to diagnose the hyperglycemia in first visit and follow-up for outcome of pregnancy.
Aims:To assess the prevalence of GDM in our hospital and to study the usefulness of a one-step procedure as a method for both screening and identification of gestational diabetes mellitus. **Methods:**This prospective study was conducted at department of Obstetrics and Gynaecology, CKM government maternity hospital, Kakatiya medical college Warangal. Patients were recruited in outpatient ward during the antenatal visits of pregnant women. All pregnant women who had 1st antenatal visit from July 2019 to September 2020 were included in present study after obtaining the informed consent.**Results:**Total of 197 mothers visiting the antenatal check-up are included in present study with mean age of 25.20±3.9yrs and BMI pre-pregnancy of 24.90±3.02kg/m^2. Majority of mothers were primigravida (447.7%) followed with 32.5% with gravida 2. All the pregnant mothers who were diagnosed as GDM were put on standard treatment regimen with Insulin or OHA. The pregnancy outcome as the birth weight of the newborn was comparable between both the groups. However, the mean weight of newborn was 3.11±0.61kg among GDM mothers and 3.05±0.57kg among the normal pregnant women. (p>0.05)**Conclusions:**Thehyperglycemia screening among the pregnant mothers attending the antenatal visit is found to be beneficial. The pregnant mothers were diagnosed with gestational diabetes mellitus at the earliest and the treatment was initiated timely. The timely intervention among the GDM mothers, have shown a comparable outcome of the pregnancy, with no significant difference in birth weight of the newborn among the normal healthy pregnancy and the GDM mothers.

Keywords: Gestational Diabetes Mellitus, Hyperglycemia, Antenatal, Morbidity, Insulin.

Introduction

Pregnancy produces progressive alterations in maternal glucose metabolism.As pregnancy proceeds insulin resistance and diabetogenic stress owing to placental hormones requires the compensatory increase in insulin production. Gestational diabetes occurs when this adjustment is insufficient. Gestational Diabetes Mellitus is defined as any degrees of glucose intolerance with onset or first recognition during pregnancy[1].Approximately 1-2 percent of all pregnant women experience irregular glucose tolerance during pregnancy, but most of the time glucose tolerance is restored to normal postpartum. This condition is known as gestational diabetes mellitus (GDM). The possibility that glucose tolerance may deteriorate during pregnancy due to diabetes-like changes in the secretive function of the endocrine pancreas has been investigated in healthy controls and in normal-weight gestational diabetic subjects. Insulin responses to oral glucose and mixed diets are similarly high in these two classes, but the insulin response per unit of glycemic stimulus is slightly lower in gestational diabetic subjects than in controls[2].GDM is linked to a sevenfold increased chance of the woman having T2DM following pregnancy, as well as foetal overgrowth, shoulder dystocia, surgical delivery, birth damage, pre-eclampsia, haemorrhage, and preterm delivery. Furthermore, the maternal metabolic environment has been recognised as a critical driver of offspring susceptibility to obesity, metabolic syndrome, and T2DM, a phenomenon known as foetal programming.Rates of macrosomia (birth weight >4000 g) or LGA (birth weight >90th centile) infants, surgical vaginal delivery, and perinatal morbidity could all be lowered if physical activity, a moderate diet, or insulin/drug therapy were started in the first trimester. Furthermore, there may be a long-term downstream effect on offspring, resulting in significant healthcare expense savings due to a reduced prevalence of metabolic illness transmission over generations. However, further research is needed to assess the effects of early intervention on short- and long-term outcomes for both mother and child. Increasing maternal carbohydrate intolerance in pregnant women is associated with a graded increase in adverse maternal and fetal outcome. . The infective cutoff limit of maternal 2 hour plasma glucose >140mg/dL causes both immediate and long term morbidity in the children, and as a result, this level assumes clinical relevance. A pregnant woman with a 2hr PG of 120-139mg/dL should be followed up on.According to WHO guideline, when a pregnant woman enters an antenatal clinic in a fasting condition, an oral glucose load of 75 g is performed and a venous blood sample is obtained for the estimation of plasma glucose (GTT) at 2 hrs. The prescribed time for screening is between 24 and 28 weeks of gestation. If found to be negative at this time, the screening test is repeated at approximately 32nd – 34th week. Both pregnant women should be tested for glucose sensitivity[3].

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Seshiah and his colleagues recorded that the 75-g GCT conducted regardless of the last meal timing was a patient-friendly approach. Women found to have normal glucose tolerance (NGT) ie; < 140mg / dl will need to undergo OGCT at the first visit during subsequent visits in all trimesters as per the guidelines of Diabetes In Pregnancy Study group India (DIPSI)[4]. Instead of performing screening test of American Diabetic Association like GCT, OGTT having low specificity, single step procedure serves both as screening and diagnostic test for hyperglycemia in pregnancy, is simple and feasible. Advantages include, pregnant women need not to be fasting, causes least disturbance in pregnant women's routine activities and severs both screening and diagnostic procedure. This research is done to assess the proportion of GDM in our hospital and to study the usefulness of a one-step procedure as a method for both screening and identification of gestational diabetes mellitus.

Methods

This Longitudinal study was conducted at department of Obstetric and Gynaecology, CKM government maternity hospital, Kakatiya medical college Warangal. Patients were recruited in outpatient ward during the antenatal visits of pregnant women. All pregnant women who had 1st antenatal visit from July 2019 to September 2020. Ethical clearance was obtained from institutional board. (IEC18114003001D)

Inclusion Criteria

All pregnant women having 1st antenatal visits and follow-up.

Exclusion Criteria

Diabetes mellitus that has been diagnosed or is being treated with metformin; Hepatitis or HIV infection, as well as chronic renal, liver, or cardiac problems; Maternal history of hypertension disorders in a prior pregnancy, which is now being treated with acetylsalicylate as a preventative measure; physical abnormalities in the foetus that are genetic, chromosomal, or intervention-required; Inability to read and/or comprehend the information sheet provided by the participant.

Study Procedure

The pregnant women underwent various investigations which include hemoglobinpercent, platelet count, total count, differential count, blood grouping, Rh typing, bleeding time and clotting time. Plasma fasting and post prandial glucose, OGTT, and HbA1, routine urine examination and thyroid function test. Ultrasonography in all trimesters for pregnancy scan, NT scan, Tiffa, Foetal 2D echo, growth scan and term scans. In a single test procedure to diagnose hyperglycemia in pregnancy in the antenatal clinic, pregnant women were given 75gm of oral glucose load after conducting a preliminary clinical examination, regardless of the time since their last meal. A venous blood sample was taken at 2 hours for the GOD-POD method of estimating plasma glucose. If 2hr plasma glucose was >140mg/dL, hyperglycemia in pregnancy was identified.The patient was informed that carbohydrate consumption and fasting duration before the test, the time of day the test is performed, and carbohydrate intake or activity during the test can all alter OGTT findings. Less carbohydrate should be consumed in the three days leading up to the OGTT. The person being tested should then should not smoke or consume caffeine containing drinks, such as coffee. The OGTT is usually scheduled in the morning and lasts for 2 hours. The test begins with a venesection before the glucose load and ends with a second venesection 2 hours following the consumption of a 75-gram glucose drink. A glucose load of 1.75 g/kg of body weight up to 75 g is used in children. (A third venesection is performed at 1 hour in some laboratories, but the results of this test are not used to interpret the OGTT.) No carbohydrate should be taken throughout the test, and the subject should stay sitting for the entire two hours. After the test, the patient can resume his or her normal routine. Fluoride-containing collecting tubes should be used for both blood samples.

On an auto analyser, plasma glucose was determined using a colorimetric-enzymatic approach (hexokinase/glucose-6-phosphate-dehydrogenase). The FIGO criteria [2] were used to diagnose GDM. A registered nurse drew all of the blood, which was kept on ice until it was brought to the laboratory the same day. No additional visit is necessary besides the standard routine antenatal care visits.Between 6 and 15 weeks of pregnancy, participants are identified at their first antenatal appointment. The women were informed about all aspects of the study by the investigator or obstetrician in charge. Informed consent covers the collection of data from medical records as well as the storage of blood for up to 10 years for additional analysis relating to the current study. Participants are advised that participation in the trial is entirely voluntary, and that they are able to withdraw at any time without affecting their subsequent care. The guidelines for excellent clinical practise for getting consent are known to all trained research assistants.

Statistical Analysis

All the patients data were recorded in patient proforma and entered in Microsoft's excel sheet. The continuous variables were summarised using mean and standard deviation; the categorical and nominal data were summarised using frequency and percentage. Both type of data are presented using pie chart and bar figures. All the data are analysed using the SPSS version 23 operating on windows 10 and p-value of <0.05 considered as statistically significant.

Results

In present study, total of 197 pregnant mothers attending the regular antenatal check-up are included after obtaining the informed consent. The mean age of the participants was 25.2±3.97yrs of age and BMI is 24.9±3.02.(Table-1)

Table 1:Showing the demographic distribution of the pregnant women included

		Frequency	Percent
Gravida	1	88	44.7
	2	64	32.5
	3	32	16.2
	4	11	5.6
	5	2	1.0
	Total	**197**	**100.0**
Para	1	79	81.5
	2	16	16.5
	3	2	2
	Total	**97**	**100.0**
Number of currently living children	1	80	40.6
	2	14	7.1
	Total	**94**	**47.7**
Prior abortion among the pregnant women	1	31	15.7
	2	10	5.1
	3	1	.5
	Total	**42**	**21.3**

Fetal death of previous pregnancy	**-**	**3**	**1.5**
Occupation	Bank employer	12	6.1
	Driver	1	0.5
	Farmer	7	3.6
	Homemaker	2	1.0
	Homemaker	66	33.5
	Labour	43	21.8
	Lecturer	3	1.5
	Maid	11	5.6
Menstrual Cycles	Irregular	43	21.8
	Regular	154	78.2
	Total	**197**	**100.0**
Mode of delivery	EL LSCS	43	21.8
	EM LSCS	71	36.0
	LMLE	69	35.0
	SPVD	14	7.1
	Total	**197**	**100.0**

EL LSCS- Elective Lower segment Caesarean section, EM LSCS- Lower segment Caesarean section LMLE Left Mediolateral Episiotomy, SPVD Spontaneous Vaginal Delivery

Table 2: Distribution of mothers at various trimesters based on blood glucose level

		1st Trimester		2nd Trimester		3rd Trimester	
		Count	**N%**	**Count**	**N%**	**Count**	**N%**
OGCT at 1st visit	<140 mg/dL	61	71.8%	55	66.3%	20	69.0%
	>140 mg/dL	24	28.2%	28	33.7%	9	31%

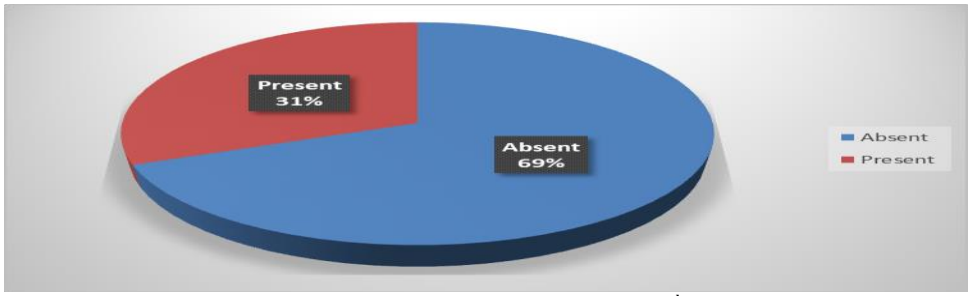

Fig 1: Frequency of mothers with blood glucose at 3rd trimester

On screening of the pregnant women, we found 31% of women with the presence of Gestational diabetes mellitus in them.

Table 3:Comparison between the groups

	Normal		GDM		
	Mean	**SD**	**Mean**	**SD**	**p-value**
Age (in years)	25.31	4.19	25.0	3.5	0.600
Pre-Pregnancy BMI (wt in cms/height in mts^2)	25.1	3.0	24.9	3.2	0.701
Outcome Birth weight of newborn(in kgs)	3.05	.57	3.11	.61	0.480

Table 4: Distribution of treatment modalities provided to the pregnant women between two groups

		Normal		GDM	
		Count	**Column N %**	**Count**	**Column N %**
Treatment given	Diet	128	100%	0	0.0%
	Insulin	0	0.0%	38	55.1%
	MNT	0	0.0%	10	14.5%
	OHA	0	0.0%	21	30.4%

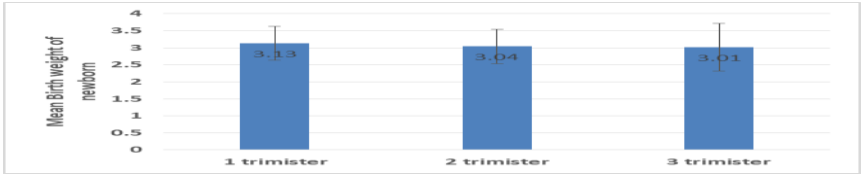

Fig 2: Birth weight of newborn based on 1st antenatal visit to the hospital

X axis: Trimester

Table 5: Over all Accuracy of Screening in the 1st antenatal visit

Hyperglycemia on Screening in the 1st antenatal visit in the first trimester	Gestational diabetes mellitus in the third trimester	
	Yes	No
Yes	9(True positives)	4(False positives)
No	15(False negatives)	136(True negatives)

Sensitivity= TP / (TP+FN)
=9/9+15=37.5%
Specificity= TN / (TN + FP).
=136/136+4=97%
Predictive value of a positive test= TP / (TP+FP)
=9/9+4=69%
Predictive value of a negative test = TN / (TN+FN).
=136/136+15=90%
Accuracy= TP+TN/TP+TN+FP+FN
=9+136/9+136+4+15=88%
Over all accuracy of Screening in the 1st antenatal visit is 88%

Discussion

Gestational diabetes mellitus is the most common medical disorder in complicating the pregnancy and pregnancy outcome. It not only complicates the pregnancy, but also associated with long term risk for both mothers and fetus. Women with gestational diabetes have high risk of metabolic syndrome and cardiovascular disease. The risk increases proportional with the maternal blood glucose concentration. Indians are more prone for developing the diabetes mellitus, hence it makes mandate for universal screening during the pregnancy. So that by early identification of women with GDM, we can prevent the maternal and perinatal morbidity and also improve the long term outcomes for both mother and fetus.In this study total of 197 pregnant mothers visiting the hospital were included in present study after obtaining the informed consent. The mean age of mothers was 25.20±3.9yrs and mean BMI was found to be 24.90±3.02kg/m^2. The mean age and pre pregnancy BMI between the GDM and normal pregnant women was comparable. As the age of patients increases the incidence of GDM also increases. Many studies have found that maternal age is highly correlated with the risk of GDM. Study by Patel et al., had 69.5% women were more than 25 years of age and 30.8% women belonged to <25 years of age. Mean age of these women was 28.79 ± 4.70 years.[5]In concordance to present study, Kumari R et al., found no significant difference in age, BMI, and religion in both groups[6]Majority of mothers were primigravida (447.7%) followed with 32.5% with gravida 2, 16.2% with gravid 3, 5.6% with gravida 4 and 1.0% with gravida 5.Majority of mothers were housewife by occupation (32.5%) followed by labour 51 (21.8%).Menstrual history was regular among the 78.2% of women and 21.8% had irregular menstrual cycle. Among the 197 pregnant mothers, 43.1% of mothers visited the hospital for the 1st time during the 1st trimester, 42.1% at 2nd trimester and 14.7% visited at 3rd trimester of pregnancy. In study by Patel M et al., documented 73.5% of women were booked with regular antenatal visit (minimum visit more than 3 times) and the rest 26.5% of women were unbooked, who were referred from either private or government hospital. Nearly 33.6% women were primigravida and whereas 66.38% women were multigravida[5].

The blood glucose level at the 1st visit during the antenatal period at different trimester was comparable and no statistical significance is elicited. However, majority of patients with blood glucose >140 were in the 2nd trimester (33.7%) and 28.2% in 1st trimester pregnancy. In current study, majority of mothers underwent LSCS (57.8%) (EMLSCS 36%, ELLSCS 21.8%) followed with delivery by left mediolateral episiotomy (35%), and 7.1% underwent spontaneous vaginal delivery (SPVD). The mode of delivery among both the group of mothers showed a comparable result, with no significant difference in them. Patel M et al., recorded nearly 54.1% had emergency cesarean section whereas 22% underwent elective cesarean sections and vaginal deliveries occurred in 23.9% GDM women[5].Another study by Kumari et al., documented no statistically significant difference in mode of delivery among the pregnant mothers between the two groups[6].On screening of the pregnant women, we found 30.% of women with the presence of Gestational diabetes mellitus in them. There is wide variability in reported prevalence estimates for GDM in India, varying from less than 4% to nearly 18%[7,8]. In study by Seshiah V et al., found GDM diagnosis at 16.3% in ≤ 16 weeks of gestation, 22.4% between 17-23 weeks and 61.3% after 23 weeks of gestation[9]. All the pregnant mothers who were diagnosed as GDM were put on standard treatment regimen with Insulin or OHA. The pregnancy outcome as the birth weight of the newborn was comparable between both the groups. However, the mean weight of newborn was 3.11±0.61kg among GDM mothers and 3.05±0.57kg among the normal pregnant women. (p>0.05) In study by Patel M et al., found about 68.7% babies had birth weight between 2.5 and 3.5 kg and 8.3% babies were of >3.5 kg and 23% babies born with birth weight <2.5 kg. They also documented complications of pregnancy outcome as macrosomia was present in 8.3%, stillbirth in 4.3%, and congenital malformation in 1.7% neonates. About 3.1% neonates required neonatal intensive care unit admission. Apgar score <7 at 1 min was found in 11.4% babies; Apgar score <7 at 5 min was found in 6.8% babies. 53.8% babies had Apgar score 9 at 5 min. In contrast the study by Kumari et al., recorded mean birth weight was significantly higher in (2848.8 ± 539.4 g) GDM group as compared to control (2707.5 ± 648.4 g)[6].Similar to present study, Mitanchez et al[10] observed that untreated moderate or severe GDM increased the risk of fetal and neonatal complications. However, the risk of neonatal complication and macrosomia was minimal with adequate treatment. They found a relationship between maternal blood glucose levels and increased birth weight. Treatment of GDM reduces the risk of macrosomia and adverse neonatal outcome. Present study documented a early detection and timely treatment of GDM favours an identical pregnancy outcome compared to a normal pregnancy. Screening based on risk factors alone will pick up only 50% of the GDM population.The Diagest study[11] examined women who did not meet ADA criteria for GDM (Box 2)[12]. A screening test (50 g glucose challenge) was offered between 24 and 28 weeks' gestation, plasma glucose being measured at 1 hour. A 100 g 3-hour OGTT was conducted if this was less than 7.2 mmol/L. Mild GDM was defined in this study as one aberrant value on the 100 g 3-hour OGTT. During the pregnancy, women with mild GDM got no treatment or specialised guidance. In this group, 21 percent of the 131 women had large-for-gestational-age babies (classified as the 90th percentile on standard growth curves), compared to 11 percent of the 108 women who had a negative 50 g GCT (p0.05). The link between macrosomia and diabetes remained after controlling for mother BMI, age, parity, and educational level (odds ratio 2.5, confidence interval 1.16-5.40). In this diabetic group, unfavourable maternal or foetal outcomes occurred about twice as frequently as in non-diabetic pregnancies.

The cost-effectiveness of GDM screening has not been thoroughly investigated. Savings over a 10-year period have been estimated as a result of a preventative programme in the United States targeted at decreasing the onset of type 2 DM in women with GDM65. Based on the premise that GDM complicates 3% of pregnancies and 50% of women with GDM develop type 2 diabetes over a 10-year period. According to data from the National Health Centre for Statistics, 62 685 women with GDM in the United States will develop type 2 diabetes in the next ten years. Over a 10-year period, the authors' economic model assumes a constant rate of progression to diabetes of

6.7 percent. In 1986 dollars14, the yearly healthcare expenditure per woman with diabetes was $2265. Over the course of ten years, the total net cost of caring for women who develop diabetes is $818.15.

Other screening methods, such as the random 50 g glucose challenge test at 24-28 weeks of pregnancy, have become popular. A conclusive test is necessary for diagnosis if the screening test is positive. The WHO recommends a 75-gram oral glucose tolerance test, with GDM diagnosed based on criteria for impaired glucose tolerance or diabetes in non-pregnant women.

Since 2020, we have been faced with the impact of the COVID-19 pandemic on health care delivery. This might also impact screening for GDM and diabetes in pregnancy. There is a need to balance the sometimes-competing requirement of lowering the risk of direct viral transmission against the potential adverse impact of service changes. A pragmatic approach to screening for GDM is advised if an OGTT is not feasible. As an alternative, FPG, RPG and HbA1c, can be used. Women with a high-risk profile or with a history of GDM need to be closely monitored. It is important that usual guidelines and care will be re-evaluated as soon as possible

Conclusion

The hyperglycemia screening among the pregnant mothers attending the antenatal visit is found to be beneficial. The pregnant mothers were diagnosed with gestational diabetes mellitus at the earliest and the treatment was initiated timely. The timely intervention among the GDM mothers, have shown a comparable outcome of the pregnancy, with no significant difference in birth weight of the newborn among the normal healthy pregnancy and the GDM mothers. Hence, universal screening of pregnant women, irrespective of gestational age and food in take, to detect GDM is mandatory.

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