

A Prospective Study on Maternal and Fetal Outcome in Gestational Diabetes Mellitus

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is “Carbohydrate intolerance of variable severity with the onset and first recognition during the present pregnancy.” Virtually, all new cases of diabetes in pregnancy are a transient form of type 2 diabetes.

Aims and Objectives of Study: The aim of this study was to study the risk factors associated with gestational diabetes and to evaluate effect of GDM on maternal and fetal outcome.

Materials and Methods: Descriptive study consecutive pregnant women diagnosed with GDM attending antenatal outpatient department (OPD) from January 2017 to September 2018 at the Department of Obstetrics and Gynaecology (OBG) of Kakatiya Medical College under Government Maternity Hospital Hanamkonda were enrolled for the study.

Conclusions: Consecutive pregnant women diagnosed with GDM attending antenatal OPD from January 2017 to September 2018 at the Department of OBG of Kakatiya Medical College under Government Maternity Hospital Hanamkonda were enrolled for the study.

Key words: Fetal outcome, Gestational diabetes mellitus, Macrosomia, Maternal outcome

INTRODUCTION

Gestational diabetes mellitus (GDM) is “Carbohydrate intolerance of variable severity with the onset and first recognition during the present pregnancy”. Virtually, all new cases of diabetes in pregnancy are a transient form of type 2 diabetes. A small proportion of cases of *de novo* diabetes is found to persist after pregnancy. Most of these are type II diabetes mellitus (DM). However, rarely type I DM will arise during pregnancy simply as a matter of coincidence.^[1]

GDM is a controversial clinical entity believed to be unmasking of a compensated metabolic abnormality characterized by a relative insulin deficiency and increased insulin resistance.

GDM is the special situation; as far as, the pregnancy is concerned, in which potential adverse effects on the fetus

and mother is paramount importance and should be clearly identified.

Jarrett^[2] wrote that GDM is non-entity whose only clinical association is with an increased risk of mother subsequently becoming diabetes.

Hunter and Milner stated that gestational diabetes is a diagnosis still looking for a disease whereas Beard and Hoet^[3] concluded that GDM is a clinical entity associated with increased maternal and fetal morbidity. It has been demonstrated that perinatal and maternal morbidity among GDM can be reduced with application of systematic approach to identification and management of the disease.

Indian data on GDM is scant and does not give the actual picture. India falls under moderately risk group and with the advent of western lifestyle, incidence of type II DM is raising precipitously. Hence, number of women with GDM is also raising, hence the need for this study.

In spite of plenty of research papers over the years, still lot of controversies remain regarding type of screening universal or selective, which diagnostic test to follow and ideal cut-off levels. This study is done to find the risk

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factors associated with GDM and the effect of GDM on maternal and fetal outcome.

Aims and Objectives of Study

The aim of this study was as follows:

1. To study the risk factors associated with gestational diabetes
2. To evaluate effect of GDM on maternal and fetal outcome.

MATERIALS AND METHODS

Source of Data

1. All pregnant women were subjected to universal screening at 24–28 weeks of gestation with 75 g of glucose and 2 h plasma glucose. >140 mgs% is taken for diagnosis (as per diabetes and pregnancy study group India [DIPSI] guidelines which are a modified version of the World Health Organization [WHO]). After diagnosis, they were subjected to HbA1c. HbA1c is >6.5% the women which were excluded from the study. If negative, the test will be repeated in the third trimester (32–34 weeks of gestation)
2. Consecutive pregnant women diagnosed with GDM attending antenatal outpatient department from January 2017 to September 2018 at the Department of Obstetrics and Gynaecology of Kakatiya Medical College under Government Maternity Hospital Hanamkonda were enrolled for the study.

Study Design

This study was prospective study.

Statistical Data Analysis

Analysis of data will be done using descriptive statistics and association between qualitative characteristics will be done using Chi-square test.

Inclusion Criteria

Pregnant women diagnosed with GDM in second (24)- and third trimester (32–34weeks) were included in the study.

Exclusion Criteria

The exclusion criteria were excluded from the study:

1. Women with overt diabetes
2. Women with any other chronic medical disorders diagnosed before pregnancy.

Sample Size

Minimum 50 participants meeting inclusion criteria from January 2017 to September 2018 were included in the study.

Methods of Collection of Data

On enrollment patients, detailed history including age, marital period, family history, obstetric history (intrauterine device, abortions, and macrosomia), medical history, and body mass index (BMI) will be taken. All GDM patients were counseled regarding the diet therapy medical nutritional therapy (MNT) and regular self-monitoring of the blood sugar at home which is required for good perinatal and maternal outcome. Venous plasma glucose is checked after 2 weeks, if persistently 2 h postprandial blood sugar >120 mg% insulin will be started in consultation with a physician or endocrinologist.

Maternal and fetal outcome were analyzed by grouping the patients as follows

- Patients treated with MNT.
- Patients treated with MNT and insulin.

Table 1: Age distribution of the sample

Age group (in years)	Number	Percentage
<20	4	8
21–25	24	48
26–30	18	36
31 and above	4	8
Total	50	100

Table 2: Parity distribution of the sample

Parity	Number	Percentage
Primigravida	16	32
Gravida-2	17	34
Gravida-3	13	26
Gravid-4	03	0
Gravida-5	01	2%
Total	50	100

Table 3: Family history of GDM

Family history	Number	Percentage
Present	15	30
Absent	35	70
Total	50	100

GDM: Gestational diabetes mellitus

Table 4: History of Complications in previous pregnancy (in multiparous only)

Complications	Number (out of n=35)	Percentage
Abortion	16	45.71
Congenital anomaly	7	20.00
Previous H/O GDM	7	20.00
Preterm delivery	4	11.43
Macrosomia	3	8.57
IUD	3	8.57

GDM: Gestational diabetes mellitus; IUD: Intrauterine device

OBSERVATIONS AND RESULTS

Most of the sample belonged to the age group of 21–30, with 48% belonging to 21–26 years [Table 1].

Table 5: BMI

BMI (KG/m ²)	Number	Percentage
<20.0	2	4
20.1–24.9	29	58
25.0–29.9	15	30
>30.0	4	8
Total	50	100

BMI: Body mass index

Table 6: Maternal complications

Complications	Number	Percentage
Polyhydramnios	6	12
Pre-eclampsia	4	8
UTI	4	8
Vaginitis	3	6
No complication	33	66
Total	50	100

UTI: Urinary tract infection

Table 7: Therapy advised

Therapy advised	Number	Percentage
Dietary modifications	33	66
Insulin	17	34
Total	50	100

Table 8: Gestational age at delivery

Gestational age	Number	Percentage
Preterm	13	26
Term	37	74
Total	50	100

Table 9: Mode of delivery

Mode of delivery	Number	Percentage
Full term vaginal delivery	20	40
Preterm vaginal delivery	8	16
Vaginal delivery (subtotal)	28	56
Elective LSCS	16	32
Emergency LSCS	6	12
Cesarean section (Subtotal)	22	44
Total	50	100

LSCS: Lower segment cesarean section

Table 10: Maternal complications comparison with parity

Parity	Maternal Complication developed (%)	No maternal Complications developed	Total
Primiparity	7 (46.67)	8	15
Multiparity	10 (28.57)	25	35
Total	17	33	50

Chi-square=1.53; DF=1; P=0.216

About 58% of the sample were primi or second parity [Table 2]. About 8% were grand multiparous.

About 30% of the sample had a positive family history [Table 3].

Out of 35 multigravid women had history of abortion [Table 4], 7 had history of congenital anomaly or GDM, 4 had preterm delivery, 3 had macrosomia, and 3 other had history of intra uterine death.

About 38% of the sample were obese [Table 5]. About 58% of the pregnant women were in the BMI range of 20.1–24.9.

Thirty-three pregnant women did not have any kind of complication [Table 6]. Of them six had polyhydromnios, four had pre-eclampsia, four had urinary tract infection (UTI), and three of them had vaginitis [Table 7].

Almost two-third of the sample was managed with dietary modifications and the remaining one-third were put on insulin [Table 8].

In the sample, 74% of the pregnancies continued beyond 37 weeks. The rest had preterm deliveries.

About 56% of the deliveries were vaginal deliveries [Table 9], 20 of 50 were full term, and 8 were preterm, 44% were cesarean sections, of which 16 of 50 were elective and 6 were emergency sections.

Primiparity with gestational diabetes were 2.18 times more likely to develop any kind of complications during their pregnancy than multiparity, but this difference was not significant statistically [Table 10].

Multiparity with GDM was found to be at higher risk of developing polyhydromnios and UTI, whereas primiparity was at higher risk for pre-eclampsia and vaginitis., but these were not statistically significant [Table 11].

It was observed that oral glucose tolerance test (OGTT) values had statistically significant moderately negative correlation with gestational age at delivery, that is, higher the OGTT values, earlier was the gestational age at delivery. Birth weights had moderate positive correlation with gestational age at delivery, that is, the longer the gestational age, the heavier was the baby at birth [Table 12].

OGTT values had moderately negative correlation with appearance, pulse, grimace, activity, and respiration (APGAR) scores, that is, with higher OGTT values, the APGAR score at 1 were low [Table 13]. Gestational age at delivery and birth weights was strongly positively correlated with APGAR scores, that is, APGAR scores tend to be higher with heavier babies and longer gestations.

DISCUSSION

Gestational diabetes is carbohydrate intolerance of various severity with onset or first recognitions during pregnancy. GDM is a risk factor for both mother and fetus. This risk increases proportionally to the maternal blood sugar concentration. Hence, we have to screen all antenatal patients with screening test between 24 and 28 weeks of gestation. In this study, we used 75 g OGTT as a one-step screening and diagnostic test. Early diagnosis of GDM reduces the perinatal morbidity and mortality [Table 14].

Green *et al.* showed that incidence of GDM was significantly greater for Chines (7.3%) and Hispanic (4.2%) women

than for blacks. Indian populations is ethnically prone to high prevalence of type 2 DM. ADA notice that 7% of all pregnancies are complicated by GDM. Anjalakshi *et al.*, in their study of 800 pregnant women, diagnosed GDM by 75 g glucose irrespective of last meal timing and found no statistically significant difference between the plasma glucose levels of glucose challenge test and WHO glucose tolerance test (GTI).

Maternal age is an established risk factor for GDM Lao *et al.* [Table 15] which indicate that the risk of GDM become significantly and progressively increase from 25 years onward. In clinical practice, maternal age >25 years should be adopted instead of >35 years or 40 years as a risk factor for the development of GDM.

Seshiah *et al.* noted increase in the prevalence of GDM [Table 16] in their study and attributed it to increased BMI, as high maternal weight is associated with a higher risk of GDM. Moses *et al.* showed that GDM was present in 11.6% cases with positive family history.

Garner *et al.* showed that preeclampsia was twice as high in GDM [Table 17]. Older studies indicated a significant increase in incidence of preeclampsia, but recent studies like Naylor *et al.* questioned this. Hydraminos affects approximately 0.4–1.5% of all pregnancies. DM may be responsible for approximately 14% of all cases of polyhydraminos.

Sibai and colleagues reported that 9% of women spontaneously delivered before 35 weeks compared with 4.5% of non-diabetic women. In our study, preterm labor occurred among the GDM patients is 30%.

Table 11: Individual Maternal complications comparison with parity

Parity	Poly hydraminios	Pre-eclampsia	UTI	Vaginitis
Primi (n = 15)	2	2	1	2
Multi (n = 35)	4	2	3	1
Total	6	4	4	3
Chi-square	0.081	0.116	0.116	0.608
DF	1	1	1	1
P-value	0.776	0.733	0.733	0.436

UTI: Urinary tract infection

Table 12: Correlation of variables

???	Age	Parity	BMI	OGTT	Gest Age	Birth weight	APGAR
Age	1						
Parity	0.262	1					
BMI	0.245	0.216	1				
OGTT	-0.043	0.111	-0.098	1			
Gestational Age	0.169	-0.062	0.108	-0.457	1		
Birth weight	0.104	-0.008	0.213	-0.171	0.375	1	
APGAR	0.075	0.008	0.154	-0.415	0.710	0.507	1

BMI: Body mass index; OGTT: Oral glucose tolerance test; APGAR: Appearance, pulse, grimace, activity, and respiration

Table 13: Significant correlations of variables

Sl. No	Variable-1	Variable-2	Correlation Coefficient (R)	P-value
1	Gestational age	OGTT	-0.457	0.001*
2	Birth weight	Gestational age	0.375	0.007*
3	APGAR	OGTT	-0.415	0.002*
4	APGAR	Gestational age	0.710	0.000*
5	APGAR	Birth weight	0.507	0.000*

OGTT: Oral glucose tolerance test; APGAR: Appearance, pulse, grimace, activity, and respiration

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Table 14: Incidence of GDM in other studies

Author	Year	Incidence (%)
Coustan and Carpenter	1982	1.5
Green <i>et al.</i>	1990	4.5
Schmidt <i>et al.</i>	2001	7.2
Vinita das <i>et al.</i>	2002	4.0
Jali <i>et al.</i>	2011	16.0
Seshiah	2012	13.4
Kalra	2013	6.6

GDM: Gestational diabetes mellitus

Table 15: Age distribution of GDM in other studies

Age	Seshiah <i>et al.</i> ^[4] (%)	Jail (%)	Present study (%)
<20 years	14.5	7.7	8
21–24	13.7	26.9	48
25–29	19.5	36.5	36
30–34	25	19.2	8
>35		9.6	0

GDM: Gestational diabetes mellitus

Table 16: Risk factor for GDM

Risk factor	Seshiah <i>et al.</i> (%)	Jail (%)	Present study (%)
family history	-	76.9	30
BMI>25 kg/m ²	33.3	78.8	38
Age>30 years	30	28.8	8

BMI: Body mass index, GDM: Gestational diabetes mellitus

Table 17: Maternal complications in other studies

Author	Polyhydramnios (%)	Preeclampsia (%)
Jindal <i>et al.</i>	6.6	21
Usha Krishna	28	48
Present study	12	8

O’Sullivan *et al.* reported that the perinatal mortality was 6.4% among GDM when compared to normal controls. In our study, 60% of GDM had APGAR score >8. All babies in GDM group had good APGAR due to good glucose control and prompt delivery and resuscitation.

In present study, among 50 GTT positive cases, 10 cases turned for follow-up. All the 10 cases were subjected to 75 g OGTT 6 weeks after delivery and GTT was normal in all four cases.

In present study, maternal mortality was nil. Perinatal mortality was also nil.

Neonatal deaths were 2%.

CONCLUSION

Indian women are more prone to gestational diabetes during pregnancy, hence the need for universal screening.

For universal screening, the WHO recommended 75 g OGTT as a one-step screening and diagnostic procedure.

On March 14, 2007, Government of India order recommended universal screening at 24–28 weeks of pregnancy with 75 g OGTT. Venous blood glucose sample of 140 mg% or more is suggestive of GDM. One step procedure is less time consuming, economical, and feasible. The two-step procedure of screening with 50 g OGTT is not practical as the pregnant women have to visit the clinic twice and 3 or 4 blood samples are drawn, which is distressing to the patient.

DIPSI procedure is cost effective, without compromising the clinical equipoise and can be continued to diagnose GDM in our country.

During our study, detected GDM patients were closely monitored and treated with either insulin or diet plan which reduced the adverse obstetric and perinatal outcome.

The timely action in screening all pregnant women for glucose intolerance achieving euglycemia and ensuring adequate nutrition may prevent in all probabilities, the vicious cycle of transmitting glucose intolerance from one generation to another and also maternal and fetal complications.

SUMMARY

During January 2017 to September 2018, all antenatal patients at 24–25 weeks of gestation were subjected to screening for GDM by a single step screening and diagnostic 75 g OGTT, out of them, 50 antenatal women diagnosed as GDM were selected.

1. Majority of GDM patients were in age of 21–29 years
2. 38% of GDM patients had BMI >25 kg/m²
3. 32% of GDM patients were primiparity
4. Family history of diabetes was present in 30% of GDM patients
5. Among GDM patients, 12% had polyhydramnios and 8% had UTIs
6. 17 out of 50 GDM patients are treated with insulin
7. Preterm delivery was seen in 26% of GDM patients
8. 44% of GDM patients underwent lower segment cesarean section, 56% had vaginal delivery
9. Among GDM patients, 12 babies had birth weight >3.5 kg
10. Neonatal complications observed were hypoglycemia, hyperbilirubinemia, and respiratory distress
11. Out of 50 GDM patients, 10 reverted back for follow-up and 75 g OGTT was normal.

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Author Queries???

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