

Fetomaternal Outcome in Gestational Diabetes Mellitus at a Tertiary Care Hospital

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Abstract

Introduction: Gestational diabetes mellitus (GDM) is a common medical problem that results from an increased severity of insulin resistance as well as impairment of the compensatory increase in insulin secretion. GDM has profound effects on fetomaternal outcome.

Aims and Objectives: This study aims to evaluate the impact of GDM on pregnancy and fetal outcome.

Materials and Methods: The present study was a prospective observational study. The screening was done by glucose challenge test and 3 h, 100 g glucose tolerance test. The study population was divided into two groups, cases and controls. All the patients were followed up for maternal complications, fetal complications, mode of delivery, and neonatal complications.

Results: A total of 350 randomly selected pregnant females who met the inclusion criteria were subjected to oral glucose challenge test. Of 350 women, 22 women were found to have GDM and were compared with non-GDM patients. GDM patients had significantly higher percentage of pregnancy-induced hypertension (13.6% vs. 2.6%, $P = 0.031$), polyhydramnios (22.7% vs. 4.3%, $P = 0.004$), urinary tract infection (40.9% vs. 14.5%, $P = 0.003$), and excess weight gain (36.4% vs. 6.3%, $P = 0.001$). GDM patients had higher cesarean deliveries in 13 (59.1%) and assisted vaginal deliveries in 2 (9.1%) as compared to non-GDM (110 [36.3%] and 6 [2%], $P = 0.006$, respectively). Among the fetal outcome, GDM patients had higher macrosomia (31.8% vs. 8.3% in non-GDM group [$P = 0.003$]), neonatal convulsions (18.2% vs. 2.3% in non-GDM group [$P = 0.003$]), respiratory distress (22.7% vs. 3.3% [$P = 0.002$]), and neonatal intensive care unit admission (72.7% vs. 12.9% [$P = 0.001$]).

Conclusion: GDM is associated with both maternal and fetal complications, most notably macrosomia leading to increased cesarean section rate and instrumental deliveries.

Key words: Fetomaternal outcome, Gestational diabetes mellitus, Glucose challenge test, Oral glucose tolerance test

INTRODUCTION

Gestational diabetes mellitus (GDM) is a common medical problem that results from an increased severity of insulin resistance as well as impairment of the compensatory increase in insulin secretion. Pregnancy, in essence, serves as a metabolic stress test and uncovers underlying insulin resistance. GDM represents a high-risk factor in pregnancy.^[1] GDM has profound effects on fetomaternal outcome.

Effects of diabetes on the mother^[2] include pre-eclampsia 10–25%, chorioamnionitis, postpartum endometritis, postpartum bleeding, and increased incidence of cesarean section. Effect of gestational diabetes on the fetus^[2] includes hypoglycemia, hyperviscosity syndrome, hyaline membrane disease, macrosomia, hypocalcemia, apnea and bradycardia, traumatic delivery, and congenital malformations. Effect of pregnancy on diabetes^[3] includes as follows: More insulin is necessary to achieve metabolic control, progression of diabetic retinopathy and nephropathy, and cardiomyopathy.

Aims and Objectives

The aims of this study were as follows:

1. To evaluate the impact of GDM on pregnancy outcome
2. To compare the pregnancy outcome in GDM group and non-GDM group.

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MATERIALS AND METHODS

The present study was conducted in the Department of Obstetrics and Gynaecology, Sher - i - Kashmir Institute of Medical Sciences (SKIMS), Soura, Srinagar, over a period of 1½ years, i.e., August 2014–January 2016. Patients with risk factors were divided into two groups, i.e., cases – positive for screening test and controls – negative for screening test.

Inclusion Criteria

The following criteria were included in the study:

1. Pregnant women between 24 and 28 weeks of gestation irrespective of the age and parity with risk factors such as overweight, history of diabetes mellitus in the first degree relatives, previous history of macrosomic baby or congenital malformations, history of instrumental difficult deliveries, and polyhydramnios.
2. Informed consent.

Exclusion Criteria

The following criteria were excluded from the study:

1. Women having diagnosed glucose intolerance before pregnancy
2. Women with a history of GDM in the previous pregnancy in whom abnormal blood sugar persisted after delivery
3. Women with a history of cardiac, respiratory, renal, and hepatic diseases or on drugs such as corticosteroids and progestogens.

Detailed history, physical examination, and routine investigations were carried out. All the subjects who fulfilled the inclusion criteria were screened for GDM. The screening was done by GCT in the patients with risk factors for GDM using 50 g of oral glucose. The women found positive on screening test were subjected to 3 h, 100 g glucose tolerance test. The glucose tolerance was assessed according to Carpenter and Coustan criteria.

The study population was divided into two groups, cases and controls. All the patients were followed up for maternal complications (pregnancy-induced hypertension [PIH], hydramnios, urinary tract infection (UTI), antepartum hemorrhage, and excessive weight gain), fetal complications (preterm birth, intrauterine fetal death, fetal macrosomia, malpresentation, intrauterine growth retardation, and stillbirth), mode of delivery (vaginal, cesarean, or assisted vaginal delivery), and neonatal complications (macrosomia, congenital malformation, convulsions at birth, respiratory distress syndrome, Apgar score 1 min and 5 min, and neonatal intensive care unit [NICU] admission).

Statistical Analysis

The recorded data were compiled and entered in a spreadsheet (Microsoft Excel) and then exported to

data editor of SPSS version 20.0 (SPSS Inc., Chicago, Illinois, USA). Descriptive statistics of data including the mean and standard deviation for numerical variables and the percentages of different categories for categorical variables were obtained. Frequency distribution tables and bar charts were used for data presentation. Student's independent *t*-test was employed for parametric data and for non-parametric data, Chi-square or Fisher's exact test, whichever appropriate, was used. $P < 0.05$ was considered statistically significant.

RESULTS

This study was carried out at the Department of Gynaecology and Obstetrics of SKIMS, Srinagar. A total of 350 randomly selected pregnant females who met the inclusion criteria were subjected to oral glucose challenge test. Of 350 women, 22 (6.3%) women were found to have GDM. Of 350 patients, 25 patients were lost in various stages of follow-up. A percentage comparison was made for various demographic parameters and outcome of GDM between the two groups. GDM patients had significantly higher percentage of PIH (13.6% vs. 2.6%, $P = 0.031$), polyhydramnios (22.7% vs. 4.3%, $P = 0.004$), UTI (40.9% vs. 14.5%, $P = 0.003$), and excess weight gain (36.4% vs. 6.3%, $P = 0.001$), as shown in Table 1. In the current study, normal delivery occurred in 7 (31.8%), cesarean deliveries in 13 (59.1%), and assisted vaginal deliveries in 2 (9.1%) as compared to non-GDM in whom normal deliveries were 187 (61.7%), cesarean deliveries were in 110 (36.3%), and assisted vaginal deliveries were in 6 (2%) ($P = 0.006$). The main indication for cesarean in GDM group was fetal distress and macrosomia. Macrosomia was found in 31.8% deliveries of GDM group as compared to 8.3% in non-GDM group ($P = 0.003$). There was a strong correlation between neonatal convulsion and GDM. Women with GDM had 18.2% of neonates with convulsion as compared to 2.3% in non-GDM group ($P = 0.003$), the main cause being hypoglycemia. The difference was highly significant. There were 22.7% of neonates with respiratory distress in GDM group as compared to 3.3% in non-GDM group ($P = 0.002$). A strong correlation was observed between NICU admission and GDM 72.7% as compared to non-GDM women 12.9% ($P = 0.001$). There was no significant difference in with respect to stillbirths (4.5% vs. 0.7%, $P = 0.19$), preterm births (9.1% vs. 4.3%, $P = 0.267$), and mean Apgar score (8.39 vs. 8.78, $P = 0.45$) [Table 2].

DISCUSSION

The present study was undertaken to find pregnancy and fetal outcome of GDM in patients at risk for GDM at SKIMS Maternity Hospital, Srinagar. The study was

Table 1: Maternal complications associated with GDM

Hypertension	GDM		Non-GDM		P-value
	n	% age	n	% age	
Present	3	13.6	8	2.6	0.031
Absent	19	86.4	295	97.4	
Total	22	100	303	100	
Hydramnios					
Present	5	22.7	13	4.3	0.004
Absent	17	77.3	290	95.7	
UTI					
Present	9	40.9	44	14.5	0.003
Absent	13	59.1	259	85.5	
Excessive weight gain					
Present	8	36.4	19	6.3	<0.001
Absent	14	63.6	284	93.7	

GDM: Gestational diabetes mellitus, UTI: Urinary tract infection

Table 2: Fetal outcome

Observations	GDM, n (%)	Non-GDM, n (%)	P-value
Preterm delivery	2 (9.1)	13 (4.3)	0.267
Intrauterine death	1 (4.5)	5 (1.7)	0.346
Malpresentation	5 (22.7)	14 (4.6)	0.006
Stillbirth	1 (4.5)	2 (0.7)	0.190
Macrosomia	7 (31.8)	25 (8.3)	0.003
Apgar score	8.39	8.78	0.45
Neonatal convulsions	4 (18.2)	7 (2.3)	0.003
Respiratory distress	5 (22.7)	10 (3.3)	0.002
NICU admission	16 (72.7)	39 (12.9)	0.001

NICU: Neonatal intensive care unit, GDM: Gestational diabetes mellitus

conducted in 350 patients taken by simple random sampling.

Maternal Complications

PIH

The prevalence of PIH was higher in GDM group in this study 13.6% as compared to non-GDM group where it was 2.6%.

Buchanan *et al.*^[4] reported the prevalence of hypertension 2.7% in GDM versus 1.1% non-GDM group. Kjos and Buchanan^[5] reported that there was increased incidence of hypertensive disorders in females with GDM and that the data were more convincing for an association with pre-eclampsia. The Fourth International Conference on GDM observed double the risk of hypertensive disorders in females with GDM as compared to normal women. Weijers *et al.*^[6] founded that women with GDM had higher rates of PIH as compared to control group. Kvetny *et al.*^[7] reported that pre-eclampsia was found in 15.5% of women with GDM as compared to 1% in non-GDM group.

Hydramnios

In this study, hydramnios was present in 22.7% of women with GDM as compared to 4.3% of non-GDM group.

Griffin *et al.*^[8] reported that hydramnios, stillbirths, abortions, and PIH were founded more in women with GDM. Sermer *et al.*^[9] reported that untreated cases of GDM were complicated with hydramnios PIH and operative deliveries.

UTIs

In this study, UTI occurred in 40.9% of women with GDM as compared to 14.5% in non-GDM group.

Forsbach *et al.*^[10] reported that GDM was complicated with toxemia in 18%, polyhydramnios in 10%, and UTI in 6%.

Excessive weight gain

In this study, excessive weight gain was seen in 36.4% of women with GDM as compared to 6.3% in non-GDM group. Weight gain of more than 1 kg/month in the second trimester and 2 kg/month in the third trimester is considered excessive.

Jindal *et al.*^[11] concluded in their study that 32% of women with GDM had excessive weight gain in pregnancy as compared to 1.7% in non-GDM group. Owen *et al.*^[12] reported that gestational glucose intolerance represents a pathological continuum affected by numerous factors, especially gestational age, maternal weight, and maternal age. Naylor *et al.*^[13] reported that as the weight gain occurs outside normal limits, the glucose intolerance also increases.

Fetal Complications

In the present study, GDM mothers had 9.1% preterm deliveries as compared to 4.3% in non-GDM, intrauterine death in 4.5% in GDM as compared to 1.7% in non-GDM group. Malpresentation was seen in 22.7% of women with GDM as compared to 4.6% in non-GDM group. Fetal macrosomia was present in 31.8% of women with GDM as compared to 8.3% in non-GDM group.

Jindal *et al.*^[11] observed preterm deliveries 12% versus 1.7%, intrauterine deaths 12% versus 1.7%, stillbirth 4% versus 1.3%, fetal macrosomia 36% versus 7.3%, and malpresentations 16% versus 6% in GDM and non-GDM group, respectively. Buchanan *et al.*^[4] reported that preterm deliveries were 10.4% in GDM group versus 7.5% in non-GDM group. Weeks *et al.*^[14] found that when compared with controls, GDM patients were at increased risk for macrosomia (26% vs. 11%), cesarean section (9% vs. 2%), and fetal loss up to 15%. Coustan *et al.*^[15] reported that fetal macrosomia occurred in about 50% in untreated patients, 36% in women on diet control, and only 7% in women on diet control plus insulin.

Mode of Delivery

In the current study, 13 of 22 women with GDM (59.1%) had their pregnancy terminated by lower segment cesarean sections (LSCS), normal delivery in 7 (31.8%), and assisted vaginal delivery in 2 (9.1%), whereas in non-GDM group,

the percentages were 36.3%, 61.7%, and 2% for LSCS, normal, and assisted vaginal delivery, respectively.

Weeks *et al.*^[14] observed that the rate of cesarean section approached to 37% in GDM group. de Veciana *et al.*^[16] reported the rate of cesarean section with GDM approached to 40–50%. Buchanan *et al.* reported the rate of cesarean section to be 24.9% in GDM group. Sermer *et al.*^[9] observed that higher cesarean section rate was founded in mothers with increasing weight, age, and body mass index. Kjos and Buchanan^[5] reported that mere knowledge that mother has GDM or has been treated with insulin increases the chance of cesarean section.

Neonatal Complications

In the current study, 7 of 22 (31.8%) women delivered large-sized macrosomic babies, i.e., more than 4 kg. The result was compared with the studies conducted by de Veciana *et al.*^[16] observed that macrosomia occurred in 15.45% of pregnancies complicated by diabetes. Coombs *et al.* observed that macrosomia occurred in 29% of patients and was associated with higher postprandial glucose levels. Hod *et al.*^[17] in their serial studies reported macrosomia in 18% of infants as a neonatal complication. Jindal *et al.*^[11] observed that macrosomia occurred in 32% versus 6.8% in GDM positive group and GDM negative group, respectively. Buchanan *et al.*^[4] observed that macrosomia occurred in 9.3% of patients with GDM. Fourth Metzger and Coustan^[18] on GDM reported that macrosomia is significantly more common in the offsprings of women with GDM.

In the present study, mean Apgar score in GDM patients at 1 min was 7.96 and at 5 min was 8.39 as compared to non-GDM group where it was 8.25 and 8.78, respectively. The difference was not statistically significant. There were no congenital malformations seen in this study. Neonates with convulsions at birth were 18.2% in GDM versus 2.3% in non-GDM group and respiratory distress in 22.7% of GDM versus 3.3% in non-GDM group.

Hod *et al.*^[17] observed that neonates with convulsion were 5.3% in GDM group as compared to 4.9% of controls and respiratory distress syndrome was 1.3% as compared to 1% in controls. Persson and Hanson^[19] observed that GDM is associated with increased risk of fetal macrosomia, birth trauma, convulsion, hyperbilirubinemia, and respiratory distress syndrome. Jindal *et al.*^[11] observed that respiratory distress syndrome was 4% versus 0.09%, hypoglycemia 4% versus 0%, and congenital malformations 8% versus 0.9% in GDM and non-GDM group, respectively.

CONCLUSION

GDM is associated with both maternal and fetal complications, most notably macrosomia leading to increased cesarean section rate and instrumental deliveries.

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