International Journal of Reproduction, Contraception, Obstetrics and Gynecology
Mohanapriya N et al. Int J Reprod Contracept Obstet Gynecol. 2016 Jun;5(6):1714-1718
www.ijrcog.org

pISSN 2320-1770 | eISSN 2320-1789

DOI: http://dx.doi.org/10.18203/2320-1770.ijrcog20161476

Research Article

Foetal and neonatal outcomes in gestational diabetes mellitus

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Received: 01 May 2016
Revised: 15 May 2016
Accepted: 17 May 2016

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ABSTRACT

Background: GDM has gained global importance because of its rising prevalence. Increasing prevalence of GDM especially among youngsters has been associated with increased complications associated with it.
Methods: A case control study conducted from October 2010 to August 2012. 100 ladies diagnosed with gestational diabetes and 100 ladies without gestational diabetes representing the general population were selected and followed till delivery. Foetal and neonatal complications in them were studied.
Results: Occurrence of macrosomia was 1% more in GDM group compared to control group. There was no still birth or respiratory distress syndrome in either group. Congenital anomaly was same 1% in either group. Preterm labour was 9% in GDM group compared to 4% in control group. Operative vaginal delivery (forceps and vacuum) was 6% in both groups. Rate of caesarean delivery was 28% in GDM group compared to 19% in control group.
Conclusions: The rate of adverse outcomes has seen lot of changes, which was high in earlier days. With increasing prevalence of GDM there is a threat for these complications to again increase. With good monitoring and treatment the adverse outcomes of GDM are not more than that of general population.

Keywords: Gestational diabetes mellitus (GDM), Neonatal morbidity, Infant of diabetic mother (IDM)

INTRODUCTION

Gestational diabetes mellitus (GDM) is defined as any degree of glucose intolerance with onset or first recognition during pregnancy.

Approximately 7% of all pregnancies are complicated by GDM, resulting in more than 200,000 cases annually.[1] The prevalence may range from 1 to 14% of all pregnancies depending on the population studied and the diagnostic criteria employed.[1,2] GDM has gained global importance because of its rising prevalence. This increase primarily is due to increase in type-2 diabetes and obesity, which is also referred to as diabesity. This term reflects the strong relationship of diabetes with the current epidemic of obesity in the United States and other countries.[3]

The increasing prevalence of type-2 diabetes in general, and in younger population in particular, has led to an increasing number of pregnancies with this complication.[4]

In India, according to a community based study (DIPAP) the prevalence of GDM is found to be 13.9%.[5] India has the largest number of diabetic patients in the world with 31.4 million diabetic subjects in the year 2000.[6] The prevalence of GDM in India varies from 9.9% in rural population to 17.8 % in urban areas.[7]

Most women who have GDM give birth to healthy neonates, especially when their blood glucose levels are well controlled with a diabetic diet, exercise and an appropriate body weight, and or oral hypoglycaemic agents or insulin. In some cases, GDM can negatively affect the pregnancy and may be associated with many maternal, foetal and neonatal complications, both short and long term. There are several studies in the west demonstrating that diabetes during pregnancy is associated with a number of adverse effects on the mother and the neonate.[8] Ethnic differences have been demonstrated not only in the prevalence of GDM but also with respect to the outcomes of the pregnancy.[8] Foetal and neonatal complications include altered foetal growth, miscarriage, stillbirth, congenital malformations, respiratory distress syndrome, cardiomyopathy, increased perinatal mortality, shoulder dystocia, brachial plexus injury, clavicular fracture, asphyxia and metabolic abnormalities like hypoglycaemia, hypocalcemia, polycythemia and hyperbilirubinemia. Maternal complications include preterm labor, premature rupture of membranes, infectious morbidities, polyhydramnios, hypertensive disorders, increased rate of caesarean and operative vaginal deliveries and maternal trauma.[9] Long term complications for the infant includes obesity, neuropsychologic defects and diabetes. Long term complications for the mother include increased risk of developing type-2 diabetes and metabolic syndrome.

METHODS

A prospective case control study was done to see the foetal and neonatal outcomes in gestational diabetes mellitus. The study population comprised of 100 pregnant ladies diagnosed with gestational diabetes and100 pregnant ladies without gestational diabetes attending our antenatal OPD. Gestational diabetes associated with other co-morbidities like pregestational diabetes, chronic hypertension, pre- eclampsia, hypothyroidism, APLA syndrome, thrombophilia, renal disorders, vasculopathies, retinopathies, multiple pregnancies were excluded.

All antenatal subjects attending our OPD were advised sugar fasting and postprandial at their first visit. Subjects falling into high risk category as per American diabetes association were advised GTT with 100 gm glucose. Those who were found to have normal values in their first visit were subjected to screening with 50 gm GCT between 24 to 28 weeks gestation. All antenatal patients who are not known diabetics undergo a glucose challenge test with 50 gm glucose at 24-28 weeks. Venous blood sugar value more than 140 mg% was considered positive for screening and these subjects were subjected to 100 gm OGTT for diagnosis confirmation. GDM was diagnosed if two or more plasma glucose levels meet or exceed the following thresholds: 95, 180, 155 and 140 at fasting, 1 hour, 2 hour and 3 hour.

Subjects with one plasma glucose value abnormal were labeled as impaired fasting glucose (IFG) if only fasting value was deranged or as impaired glucose tolerance (IGT) if one of any other value was deranged and were excluded from the study. Patients diagnosed as GDM were advised diabetic diet for 7 days. 6 point sugar profile (fasting, postprandial, before lunch, after lunch, before dinner, after dinner) was repeated after 7 days. Based on the level of sugar control they were advised either to continue with medical nutrition therapy or started on glyburide, metformin or insulin. Blood sugar control was monitored with 6 point sugar profile fortnightly or more frequently based on individual patient profile. Euglycemia was achieved in all cases. Pregnancy was electively terminated at 38 week to 39 week, unless there was indication to intervene earlier or they delivered spontaneously earlier. Outcomes were looked for in both groups.

Ethical approval was obtained from our ethical committee prior to commencement of the study. All study participants were given written and oral information about the study and provided written informed consent to participate and have birth outcomes reviewed after delivery.

Statistical analysis was performed by a commercial package program (SPSS version 17, Chicago Illinois). Chi-square test was performed to assess the statistical significance. Odds ratio (OR) and 95% confidence intervals (CI) were calculated. All p-values were two-tailed and values of <0.05 were considered significant. The results are given as mean standard deviation (SD) for normally distributed data and as frequencies (n) and percentages (%) for nominal data.

RESULTS

Foetal and neonatal outcomes from 100 GDM and 100 non-GDM mothers were studied and analysed (Table 1).

Table 1: Maternal age.

Study subjects	N	Mean	SD	P value
GDM	100	26.00	4.028	0.957
Non GDM	100	26.03	3.888	

The average age of the mothers in both groups were comparable with a mean of 26 in GDM group as compared to 26.03 in non GDM group. Both groups were matched in their parity (Table 2).

Family history of GDM was present in 35 mothers in GDM group and 3 members in non-GDM group which had an odds ratio of 17.41 (4.85 to74.25) (Table 3). The association was statistically significant with a p-value of 0.0000. History of GDM in previous pregnancy was present in 5 mothers in GDM group and 1 mother in non-GDM group which had an odd's ratio of 5.43 and p-value of 0.09252 which was not statistically significant (Table 4).

Table 2: Maternal parity status.

Study subjects		Total
GDM	Non GDM	
48	48	96
42	42	84
9	9	18
1	1	2
100	100	200

Table 3: Family history of diabetes.

Family history of diabetes	GDM	Non- GDM	Odds ratio
Present	35	03	17.41 (4.85 to 74.25)
Absent	65	97	

Chi square: 33.27, Degree of freedom: 1, P value: 0.00000

All mothers of GDM group could achieve good glycaemic control. 67 out of hundred achieved good controls with medical nutritional therapy and exercise, 21 ladies were controlled with metformin tablets, 6 had been given glibenclamide and 6 required insulin therapy. The blood sugar values were regularly followed up.

The average gestational age of delivery in GDM in group was 37.65 weeks whereas in non GDM group it was 38.47 weeks (Figure 2).

Premature rupture of membranes was present in 5 patients in GDM group and 4 patients in non GDM group; the difference was not statistically significant and had a p-value of 1. 28% of GDM patients underwent cesarean delivery compared to 19% of patients in non GDM group (Table 6, Figure 1), but this increased rate of cesarean in GDM group was because of post caesarean pregnancy. 9% of GDM patients underwent preterm delivery whereas in non GDM group it was 4%. The difference was not statistically significant.

Macrosomia defined as birth weight more than 4000 gm was 1 in GDM group and no baby weighed more than 4000 gm in non GDM group. Mean birth weight was almost same in both groups (Figure 3).

There were no miscarriage or stillbirth observed in either groups. There was 1 neonate in GDM group who had congenital anomaly, and in non GDM group also 1 neonate had congenital anomaly. Baby born to GDM mother had tracheo-oesophageal fistula and anorectal atresia and 1 patient in non GDM group had cleft lip and cleft palate. There was 1 case of respiratory distress syndrome in GDM group who delivered at 33 weeks and no respiratory distress syndrome was present in non GDM group (Table 5).

Table 4: History of GDM in previous pregnancy in multigravidas.

Previous history of GDM	GDM	Non GDM	Odds ratio
Present	05	01	5.43 (0.6113 - 48.1566)
Absent	47	51	

Chi Square: 2.8299; P value: 0.09252, Degree of freedom: 1

Table 5: Primary outcomes.

Outcome	GDM (n=100)	Non GDM (n=100)
Stillbirth	0	0
Preterm delivery	9	4
Macrosomia 4000-4500	1	0
Congenital malformations	1	1
Respiratory distress syndrome	1	0
Miscarriage	0	0

Table 6: Mode of delivery.

Mode of delivery	GDM	Non GDM
Cesarean	28	19
Forceps	1	0
Vacuum	5	6
Normal vaginal	66	75

Chi Square: 3.39, Degree of freedom: 3, P-value: 0.33547

The association between modes of delivery and study participants was assessed and it was found that there was no statistically significant association (p: 0.33547).

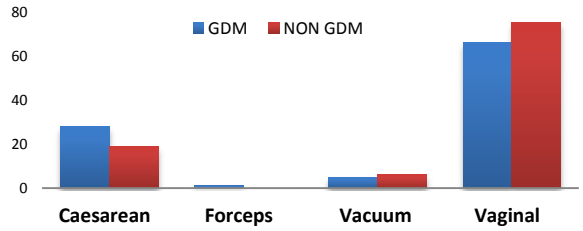


Figure 1: Mode of delivery in GDM and non-GDM patients.

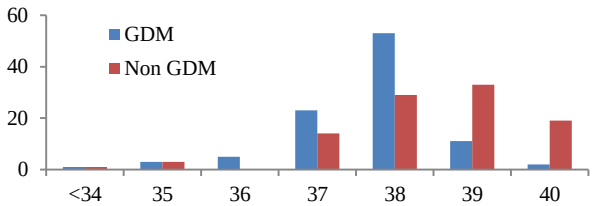
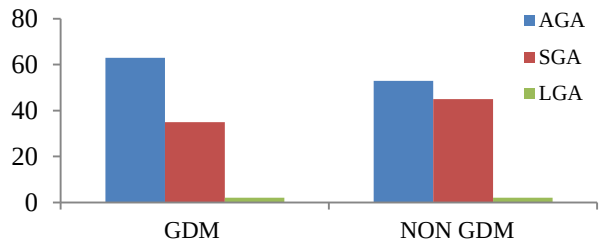


Figure 2: Period of gestation of delivery of GDM and non GDM patients.



AGA (appropriate for gestational age), SGA (small for gestational age), LGA (large for gestational age).

Figure 3: Birth weight as per gestational age in GDM and non GDM patients.

DISCUSSION

Diabetes mellitus is a common complication of pregnancy. GDM can adversely affect the foetal and neonatal outcomes.[10] However with tight glycemic control and improved monitoring these complications can be significantly reduced. But the ideal degree of glycemic control is still controversial.[11,12]

The purpose of screening, treatment and management of GDM is to prevent stillbirth, and decrease the incidence of LGA babies, thereby reducing maternal and perinatal morbidity and mortality.

Macrosomia is a known complication of GDM and it is a proven fact that post prandial hyperglycemia is associated with increased incidence of macrosomia. The macrosomia rate in our study is lower than various studies reported in literature like 5.9% in the study conducted by Landon MB in 2009, 9.7% by Schmidt in 2001, 27.6 % by Shefali AK in 2006 and 18.90 by Hirst in 2012.[13-16] This observed difference can be due to better glycemic control or due to different genetic, demographic and maternal metabolic factors that are known to affect foetal growth. The difference may also be due to different diagnostic criteria applied in different literatures. Although glycemic control plays an important role in determining foetal size, excessive maternal weight gain and obesity also strongly influence neonatal birth weight, even in women without glucose intolerance.[17,18] This is a limitation in our study as these confounding factors were not included in our study.

Also, good glycemic control can reduce the risks of shoulder dystocia and caesarean delivery.[13,19] Another basic aim of ensuring glycemic control is to prevent stillbirth which is again a known complication of GDM. Although various hypothesis has been proposed, in majority of cases the cause still remains idiopathic. This increase in stillbirth rates have been related to increased fasting glucose levels. There was no stillbirth in our study which is comparable to literature.[13,19,20]

The occurrence of respiratory distress syndrome was not increased in the neonates of GDM mothers in our study compared to literature.[13,19,20] A comprehensive review by Piper in 2002 explained the importance of glycemic control where diabetic women with good glucose control had babies with lung maturation similar to that of non-diabetic population.[21] Another important factor may be avoidance of iatrogenic prematurity by termination after 38 weeks.

We had 9 spontaneous preterm delivery in our study which was slightly higher than non GDM patients which was 4, and the rate is in accordance with that quoted in other similar studies.[13,16] Literature does not show an increased incidence of congenital anomalies in gestational diabetes compared to that of general population, again related to hyperglycemia at periconceptional period and during period of organogenesis. This is also reflected in our study and comparable to other studies.[15,20]

Many studies have found high caesarean delivery rates in GDM patients despite good maternal blood glucose control during pregnancy.[22] The significantly higher rate of caesarean delivery in GDM patients compared to the controls, is found in this study also. The most common indication for caesarean in this study was previous history of caesarean sections. The caesarean rate of 24.1% in this series correlates with 19-30% reported in previous studies.[23]

Despite literature report showing adverse foetal and neonatal outcomes in gestational diabetes, this study has shown no increased occurrence of these complications. As per our institutional policy the antenatal clients are booked earlier preferably within 16 weeks. It is also our institution policy to screen universally all clients for gestational diabetes. This helps us to diagnose GDM at earlier stages. We are able to get good glycemic control using oral hypoglycemic agents and insulin and by also involving dietician and endocrinologist apart from obstetrician.

CONCLUSION

Gestational diabetes mellitus is a common complication of pregnancy and is undoubtedly associated with increased frequency of adverse foetal and neonatal outcomes. The theory of in-utero programming where offspring of GDM patients are more prone to develop obesity, diabetes and gestational diabetes in future, which in turn sets a vicious cycle which will again enormously contribute to the increasing prevalence of gestational diabetes and its associated adverse foetal and neonatal outcomes.

Though gestational diabetes has been a clinical entity for years, it has always been associated with controversies, including differences in screening strategies, diagnostic criteria, monitoring and treatment modalities. The rate of adverse outcomes has also seen lot of changes, which was high in earlier days. However with availability of better

monitoring facilities and treatment modalities the rates have decreased. But with the increasing prevalence of GDM there is a threat for these complications to again increase. But the results of our study and other similar studies are reassuring that, with good monitoring and treatment the adverse outcomes of GDM are not more than that of general population.

Funding: No funding sources
Conflict of interest: None declared
Ethical approval: The study was approved by the Institutional Ethics Committee

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Cite this article as: Mohanapriya N, Srivastava AK. Foetal and neonatal outcomes in gestational diabetes mellitus. Int J Reprod Contracept Obstet Gynecol 2016;5:1714-8.