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Analysis of gestational diabetes mellitus from a tertiary care hospital

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Abstract

Background: Gestational diabetes mellitus (GDM) poses problems for both mother and fetus. The objective of this study was to compare the maternal and perinatal outcome between women with gestational diabetes mellitus and non-diabetic women.

Study Design: A case–control study with 140 cases and 140 age-matched controls was conducted for a period of 22 months (August 2013–June 2015) in Dept of Obg mvj medical college. Hoskote, Bangalore.

Materials and Methods: Universal screening was applied by means of glucose challenge test (GCT) using 50 g of glucose. If GCT >130 mg%, the patients were subjected to oral glucose tolerance test with 100 g of glucose. National Diabetes Data Group criteria was taken to assign patients to study group. These women were further followed up and the maternal and perinatal outcomes were assessed.

Statistical Analysis: Univariate analysis was done by means of *t* test, Odd's ratio, Chi-square test, and Fisher Exact test. $P < 0.05$ was taken as significant.

Results: The frequency of induction of labor was significantly higher than spontaneous labor. 40.1% GDM mothers and 35.8% of non-diabetic mothers were delivered by Cesarean section. Premature rupture of membranes (PROM) was the most common complication of labor Babies of diabetic mothers had a positive trend toward prematurity Hypoglycemia was the most common neonatal complication and nine babies of diabetic mothers were macrocosmic.

Conclusions: Maternal morbidities and neonatal complications such as neonatal hypoglycemia, macrosomia, and prematurity were significantly higher in GDM.

Keywords: Gestational diabetes mellitus, Outcome, Chi-square test, Odd's ratio

Introduction

The International Diabetes Federation estimated that currently there are 100 million people with diabetes worldwide representing about 6% of all adults.[(1)] Indeed, the number of people with diabetes in India is likely to double in less than 2 decades, from 39.9 million (in 2007) to 69.9 million by 2025.[(2,3)] The Indian Council of Medical Research study done in the 1970s reported a prevalence of 2.3% in urban areas[(4,5)] which has risen to 12–19% in 2000s. Prevalence of diabetes is increasing globally, particularly in the developing world with China and India contributing a major part of the increasing burden. A serious concern is that India is projected to have the highest population of people with diabetes in the world, by 2030.[(6)] The rise in prevalence is attributed to aging population, urbanization, rising obesity, unhealthy diets and physical inactivity, in addition to the genetic predisposition of South Asians to diabetes.[(7)] While all these factors do contribute to the epidemic of diabetes, early life programming seems to play a facilitator role and prepare the ground for adult life risk factors to come into play. The `Foetal Origin of Disease' hypothesis proposes that susceptibility to adult diseases may be influenced by gestational programming,[(8)] whereby stimuli or stresses encountered by the fetus at critical or sensitive periods of development can permanently induce structural, physiological, and metabolic changes, which predispose the individual to disease in adult life.[(9)] Normal pregnancy is a Diabetogenic state due to changes in pattern of insulin secretion and sensitivity, thus pregnancy induces progressive changes in maternal carbohydrate metabolism. There is insulin resistance in normal pregnancy due to placental hormones (Human Placental Lactogen, Cortisol, Estriol, and Progesterone). There is a wide variation in the prevalence rate of GDM mainly due to ethnic differences, demographic profile, different screening procedures, maternal age, parity, pre-pregnant BMI. 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. GDM has both short term and long term consequences on both baby and the mother, including a predisposition to obesity, metabolic syndrome, Type-2 diabetes and cardiovascular diseases later in life. Early detection and intervention can greatly improve outcome for women and their babies.

Babies born to mothers with GDM are at increased risk of complications, primarily growth abnormalities and chemical imbalances such as hypoglycemia.[(10,11)] If optimal care is delivered to the diabetic mother, the perinatal mortality rate, excluding major congenital anomalies, is nearly equivalent to that observed in normal pregnancy.

Despite the number and consistency of studies reporting a higher risk of GDM with increasing body weight or BMI, the magnitude of this association remains uncertain. This is due in part to the wide variation in reported GDM prevalence among different populations, as well as the lack of consistency in diagnostic methods and definitions for GDM.[12,13] The prevalence of GDM in India as 16.55%.[14]

Materials and Methods

This case–control study was carried out at department of Obg. Mvj medical college hoskote Bangalore, from August 2013 to June 2015. This is a tertiary care hospital and its maternity service is a referral centre in the care of high risk pregnant women

Selection Criteria for Study Group: The study group included women who developed carbohydrate intolerance of varying severity with onset or first detection in present pregnancy. The antenatal women were monitored with glucose challenge test (GCT) at 24–28 and 32–34 weeks, or whenever any risk factor developed during pregnancy. They were given a 50 g GCT, and if the plasma glucose value exceeded 130 mg/dl, a 100 g oral glucose tolerance test (OGTT) was performed after overnight fasting. For the purpose of this study, GDM cases were selected based on American Diabetes Association (ADA) National Diabetes Data Group (NDDG) revised criteria of O'Sullivan and Mahan criteria.[15]

Control Group: Pregnant women who had a normal GCT with 50 g of glucose at 24–28 weeks, followed by a normal OGTT with 100 g of glucose. Next normal case of the same age, after a study case, was taken as a control.

After the diagnosis of GDM was made, patients were prescribed a diabetic diet depending on their body mass index (BMI). After 2 weeks on the diet, the glycemic profile measuring the venous glucose level was performed in the fasting state and also 2 h after each main meal. If the fasting glucose concentration was≤95 mg/dl and 2 h after each meal ≤120 mg/dl, dietary recommendation was considered adequate. If these values were exceeded, provided there was good compliance by the patient to her diet, the patient was admitted and started on insulin treatment.[16] Insulin was started at the lowest dose and titrated according to the blood sugar levels.

Antenatal fetal surveillance was initiated depending on the severity of carbohydrate intolerance. Vaginal delivery was encouraged in all cases. Cesarean section was done for obstetric indications. The pregnancy outcome was assessed as regards to (a) maternal factors such as spontaneous/induced deliveries, vaginal/cesarean section, and premature rupture of membranes (PROM); and (b) fetal factors such as macrosomia, congenital anomalies, sepsis, respiratory distress, hypoglycemia, and prematurity.

As appropriate, Student's **t** test was used to compare groups for continuous variables, while Chi-square test or Fishers' exact test was used to compare proportions. Odd's ratio was calculated and all the computations were done by computer software, statistical package for social sciences (SPSS) version 10. Data obtained were compared in percentages and means. **P** < 0.05 was considered as statistically significant.

Results

During the study period from August 2013 to June 2015. 140 cases and 140 controls available for follow-up (Fig. 1). The mean age of cases was 26.6 ± 4.45 years and the mean age of controls was 26.4 ± 4.4 years. The **t** test showed no significant difference between the two.

Table 1: Maternal Outcome

Maternal outcome	Cases *n* (%)	Controls *n* (%)
H/o pre-eclampsia		
Present	42 (30)	25 (18)
Absent	98 (70)	115 (82)
Type of labor		
Induced	81 (58)	60 (43)
Spontaneous	59 (42)	80 (57)
Vaginal delivery		
Yes	82 (59)	89 (64)
No	58 (41)	51 (36)
LSCS		
Yes	56 (40)	50 (36)
No	84 (60)	90(64)
PROM		
Yes	22 (16)	14 (10)
No	118	126

LSCS lower segment cesarean section, *PROM* premature rupture of membranes.

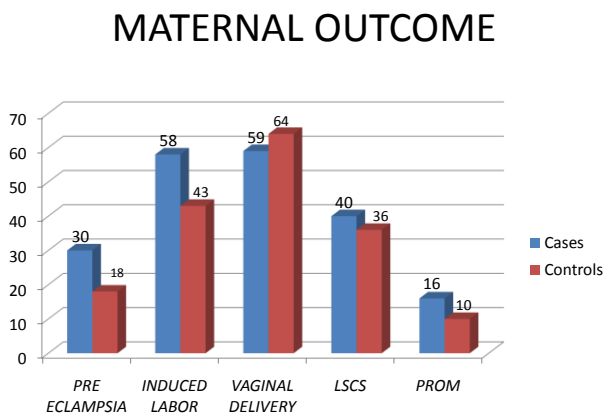
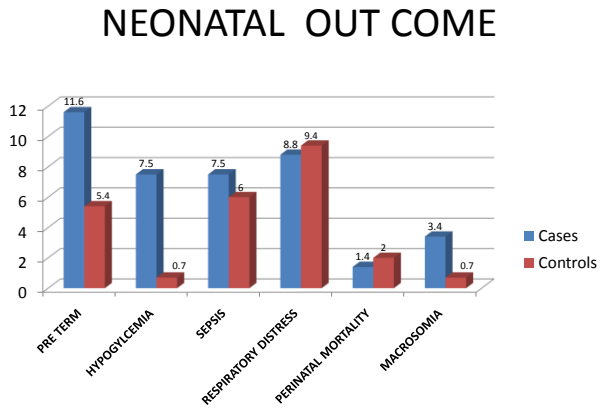


Table 2: Neonatal outcome

Neonatal outcome	Cases n (%)	Controls n (%)
Maturity		
Preterm	15 (11.6)	7 (5.4)
Term	125 (88.4)	133 (94.6)
Hypoglycemia		
Yes	10 (7.5)	1 (0.7)
No	130 (92.5)	139 (99.3)
Sepsis		
Present	10 (7.5)	8 (6.0)
Absent	130 (92.5)	132 (94)
Respiratory distress		
Present	12 (8.8)	13 (9.4)
Absent	128 (91.2)	127 (90.6)
Prenatal mortality		
Yes	2 (1.4)	3 (2.0)
No	138 (98.6)	137 (98.0)
Macrosomia		
Yes	5 (3.4)	1 (0.7)
No	135 (96.6)	139 (99.3)



Neonatal outcome

Fig. 1: Macrosomic baby

Discussion

Very few studies are available from India assessing the outcome of GDM.[12,13] Our study conducted in a tertiary care hospital highlights the importance of taking proper antenatal care in the case of GDM mothers to prevent perinatal morbidity and mortality both for the mother and child, especially in an area where the prevalence of gestational diabetes is relatively very high. GDM cases were found to be more among housewives who led a sedentary life style (95.3%) with a predisposition to higher BMI. The prevalence of GDM ranges from 0.2%-12% depending on the population studied. By using single step diagnostic test, the prevalence of GDM in our study was 13.5% which is Similar to the study conducted by V Balaji et al (2009), they found prevalence rate of 13.4%[14] while Wahi et al (2011) found the prevalence rate of 6.94%[15] which is less than our study. Variation among these prevalence rates could be because of geographical, racial, socio-demographic differences in the studied population.

Maternal Outcome: Pre-eclampsia was significantly associated with GDM in our study. Observational studies have shown mixed results and are inconclusive as to whether women with GDM have a higher risk for pre-eclampsia than women without GDM.[13,14] Recent data from untreated women with GDM reveal a rate of pre-eclampsia (about 9%) that is similar to that of treated women and women without GDM.[17,18]

It was observed that GDM mothers had increased frequency of induced deliveries as compared to spontaneous deliveries. There was an increased incidence of cesarean section in GDM patients (40% of diabetic pregnancies vs. 36% of non-diabetic pregnancies. According to a one study in 2007, the rate of cesarean sections and inductions of labor were increased in the GDM mothers.[19] This was also in agreement to other similar studies.[17,19]

Of the maternal complications, 16% had PROM with others showing a lower incidence, and this was statistically significant in the GDM group. A study in 2006 concluded that women with GDM who were diagnosed and treated following treatment guidelines

demonstrated no severe maternal and neonatal complications.[20]

Fetal Outcome: The incidence of macrosomia in GDM mothers was 3.4%, while 0.7% in non-diabetic mothers, which was statistically significant. Previous studies revealed that macrosomic babies were associated with history of prior GDM pregnancy and pre-pregnancy BMI ≥25.[21,22]

Of the total deliveries, 11.6% of cases delivered premature babies while 5.4% of the babies of control group were preterm, which was statistically significant (**P** = 0.007). Owing to the increased liquor, there was higher chance of the GDM mothers to go into preterm labor and prematurity.

Among the babies delivered, the incidence of in-born nursery (IBN) admission for babies of GDM mothers was more for various reasons like sepsis (7.5%), hypoglycemia (7.5%), prematurity (11.6%), respiratory distress (8.8%), and congenital anomalies (6.4%).

One of the complications observed was hypoglycemia, which was also found to be statistically significant. A study reported that 4% of infants of women with GDM required intravenous glucose therapy for hypoglycemia.[23] Another study concluded from the cross-sectional study of 162 gestational diabetes women that the most common neonatal complication was hypoglycemia (**n** = 111, 68.5%) and macrosomia was found in 29 cases (17.9%).[20] The prenatal mortality between the two groups was not significantly different. The likelihood of fetal death with appropriately treated GDM has been found no different than in the general population.[16]

In conclusion, as compared to non-diabetics, gestational diabetics have higher maternal and neonatal complications. The observation and quantification of maternal outcomes with GDM are necessary so that appropriate measures can be taken to reduce complications during pregnancy, delivery, and the neonatal period.

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