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Full length article

Gestational diabetes–Predictors of response to treatment and obstetric outcome

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ABSTRACT

Objective: Evaluate patient characteristics that are predictors of treatment response and outcomes in gestational diabetes
Study design: Retrospective cohort of 265 women with gestational diabetes treated with diet/metformin and/or insulin in a single centre over 2 years.
Results: Multinomial logistic regression showed that (after adjusting for age and ethnicity) women who were of normal weight were more likely to be on diet and women who were obese were more likely to be on metformin or metformin and insulin($p = 0.014$). Women who were obese were twice more likely to have labour induced than those with normal weight. Onset of labour was the only parameter significantly associated with a treatment modality among the three groups ($p < 0.001$). There was no difference in the incidence of large for gestational age, neonatal admission, shoulder dystocia or still birth between the three groups.
Conclusions: Maternal BMI appears to be the only parameter that is predictive of need for treatment with metformin/insulin and the modality of treatment does not have an effect on maternal and neonatal outcomes.

Introduction

Gestational diabetes mellitus (GDM) is associated with an increased risk of morbidity in both mother and baby. The aim of management is to reduce maternal hyperglycemia and reduce perinatal morbidity. Maternal morbidity is due to induction of labour, operative delivery and perineal trauma. Adverse perinatal outcomes include prematurity, macrosomia, shoulder dystocia, stillbirth and neonatal hypoglycameia [1,2]. Women with gestational diabetes have a seven fold increased risk of developing Type 2 diabetes long term [3], and children born to mothers with GDM have a higher body mass index (BMI), raised fasting glucose levels and an increased risk of developing Type 2 diabetes in later life [4,5].

Several studies have identified factors such as fasting blood glucose, maternal age, maternal BMI, ethnicity and previous pregnancy history as predictors of requirement for medical therapy [6–8]. However; there are limited studies assessing predictors of response to treatment and pregnancy outcome.

In our unit, all women with GDM are seen in a joint-diabetic antenatal clinic by an obstetrician, endocrinologist, midwife, diabetic nurse and a dietician. There were no variations in practice as the same team cared for the cohort throughout the period of study. The aim of this study was to identify characteristics associated with response to diet or medical therapy and to compare the variation in maternal and neonatal outcomes.

Materials and methods

This was a retrospective study of 265 pregnant women with gestational diabetes mellitus (GDM) over a two-year period 2014–2016, conducted at Epsom and St Helier University Hospitals NHS Trust. The trust delivers 5000 women per annum and serves a diverse population of inner-city south London and Surrey with varying socio-economic characteristics.

This study focused on women with gestational diabetes and excluded women with pre-gestational diabetes type1 and 2.

All women booked for care in our hospital are triaged at the start of pregnancy for risk factors for gestational diabetes. Women

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with BMI (> 30), persistent glycosuria, large for gestational age fetus, ethnicity (African, afro-Caribbean and Asian), family history, previous large baby (>4.5 kg) and polyhydramnios were offered an oral glucose tolerance test (OGTT) using 75 g of glucose at 24 to 28 weeks gestation.

The test was positive for gestational diabetes if they had either: a fasting plasma glucose level of > 5.6 mmol/l or a 2-h plasma glucose level of > 7.8 mmol/l. Women with a history of gestational diabetes in previous pregnancy (managed on diet or medication) were asked to self-monitor their blood glucose levels from 16 weeks. In the index pregnancy; women at low risk of gestational diabetes were offered glucose monitoring if they developed persistent glycosuria or a large for gestational age fetus on ultrasound or unexplained polyhydramnios.

The initial management was by diet modification, and if the glucose control was not optimized they were then offered metformin at a dose between 500 mg to 3000 mg per day titrated according to response in glucose control.

Insulin was added to optimise control if metformin and diet did not control glucose levels or if metformin was not acceptable due to side effects.

The targets were to optimise the fasting level below 5.3 mmol/l and a postprandial level below 7.8 mmol/l at 1 h or a level of 6.4 mmol/l at 2 h postprandial.

All women had a fetal ultrasound assessment at 28, 32 and 36 weeks of gestation. Women who were controlled on diet alone were allowed to await spontaneous labour until 41 weeks. Women on treatment were advised to undergo induction of labour at 39 weeks gestation.

Fetal macrosomia was defined as an abdominal circumference (AC) > 97th centile for gestation. Shoulder Dystocia was defined as a vaginal cephalic delivery that requires additional obstetric maneuvers to deliver the fetus after the head has delivered and gentle traction has failed. Preterm delivery was defined as delivery before 37 completed weeks of gestation.

Birthweights were plotted according to gestational age-appropriate centile charts and classified as follows:

Normal birthweight: 50th percentile for gestational age,

Low birthweight: 10th percentile – 2 standard deviations (SD) below 50th percentile for gestational age,

High birthweight: 90th percentile – 2 SD above 50th percentile for gestational age

Three comparative cohorts were analysed based on type of treatment needed to control the glucose level; Diet control group, metformin group, and metformin and insulin group. Demographic details, previous obstetric history, obstetric complications and perinatal outcome data were compared across these groups.

Continuous variables such as age and BMI were described using the median and interquartile range (IQR), while categorical variables such as parity, ethnicity, mode of delivery were described using frequencies and percentages.

Logistic regression analysis was used to assess characteristics associated with need for diet alone, metformin and metformin plus insulin for optimal control of glucose. Statistical differences in the outcomes were compared.

Predictors of need for treatment were defined as age, ethnicity, BMI, parity, previous GDM and previous birth weight.

Obstetric outcomes were defined as delivery mode, onset of labour, birthweight, neonatal admission, still birth, and shoulder dystocia.

Potential confounders were age and ethnicity and those were controlled for in the models.

Results

This study included 265 women that met the criteria for a diagnosis of gestational diabetes. Of these; 52.1% (138/265) were managed by diet, 37.4% (99/265) were managed by metformin and 10.6% (28/265) were managed by metformin and insulin. The median age was 34 years (19–45), with a median BMI of 26.3 (17.5–50.5).

Table 1
Cohort characteristics by type of treatment.

N = 256		Diet	Metformin	Metformin + Insulin	p-value
		138 (52.1)	99 (37.4)	28(10.6)	
Age (years)					0.2516
	Mean (SD)	34.2(5.1)	33.4(5.0)	35.0(48)	
Ethnicity					0.314
	white	106 (76.8)	77 (77.8)	23 (82.14)	
	asian	22 (15.9)	13 (13.1)	1 (3.6)	
	black	4 (2.9)	1 (1.0)	1 (3.6)	
	mixed	6 (4.4)	8 (8.1)	3 (10.7)	
BMI					0.014
	normal	64 (46.4)	35 (36.4)	7 (25.0)	
	overweight	47 (34.1)	33 (33.3)	7 (25.0)	
	obese	27 (19.6)	31 (31.3)	14 (50.0)	
Parity					0.278
	primiparous	35 (25.4)	18 (18.2)	4 (14.3)	
	multiparous	103 (74.6)	81 (81.8)	24 (85.7)	
Previous GDM					0.322
	no	94 (68.1)	67 (67.7)	15 (53.6)	
	yes	44 (31.9)	32 (32.3)	13 (46.4)	
Previous birthweight					0.506
	normal	92 (66.7)	75 (75.8)	22 (78.6)	
	low	6 (4.35)	3 (3.03)	1 (3.6)	
	high	40 (29.0)	21 (21.2)	5 (17.9)	
Smoking					0.932
	no	130 (94.2)	93 (93.9)	26 (92.9)	
	yes	8 (5.8)	6 (6.1)	2 (7.1)	
Alcohol					0.469
	no	115 (83.3)	88 (88.9)	25 (89.3)	
	yes	23 (16.7)	11 (11.1)	3 (10.7)	

Fisher Exact test for categorical variables and Wald test for continuous variables