

*Short Communication***Diabetes and pregnancy: Time to rethink the focus on type 2 diabetes**

Dharmesh KOTHARI and Boon H. LIM

*Department of Obstetrics and Gynaecology, Royal Hobart Hospital, Hobart, Tasmania, Australia*

With the increasing prevalence of diabetes and obesity in Australia, more women with type 2 diabetes are becoming pregnant. Our study confirms that pregnancies with type 2 diabetes have poorer outcomes and there is a strong need for further research into modification of risk factors associated with adverse pregnancy outcomes, particularly in type 2 diabetes. We believe it is time to rethink the strategies to improve their outcomes.

**Key words:** gestational diabetes, pregnancy, pre-pregnancy care, type 1 diabetes, type 2 diabetes.

**Introduction**

Almost one in four Australians 25 years and over has either diabetes or elevated blood sugar that is not quite in range of diabetes.<sup>1</sup> There is increasing prevalence of obesity and type 2 diabetes in women of the reproductive age group, and this is expected to continue to rise.<sup>1</sup> Evidence suggests that outcomes for pregnancies in type 2 diabetes tend to be worse.<sup>2</sup> On this basis, we felt that it was important to assess outcomes for women with diabetes in pregnancy seen at the combined Obstetric Endocrine Clinic of Royal Hobart Hospital (RHH), which is a tertiary referral hospital for the state of Tasmania.

Women with type 1 diabetes are already well known to the diabetes service and tend to receive pre-pregnancy counselling and care as they are seen for their annual review where contraception and pregnancy intentions are discussed with them. Type 2 diabetics do not always receive the appropriate pre-pregnancy counselling, and it is this group of women who should benefit from improved strategies of care both in the pre-pregnancy period and antenatally. Thus, understanding the outcomes associated with their pregnancies will help to develop strategies for care, both in hospital and in primary care.

**Materials and Methods**

The maternity unit at RHH manages approximately 2000 deliveries per annum and receives high-risk pregnancies

referrals from other maternity units in the state of Tasmania. This was a retrospective study of all pregnancies complicated by pregestational and gestational diabetes for a five-year period, from July 2006 to June 2011. The decision to assess the case notes during this period is because the medical records at RHH became electronic from June 2006; hence, the Digital Medical Records (DMR – the hospital's clinical database) were used to search for the case notes for this review. For the purpose of study, the keywords 'diabetes in pregnancy', 'type 1 diabetes', 'type 2 diabetes', 'pregnancy' and 'gestational diabetes' were entered into the DMR data base for the period.

This study was limited to assessing the obstetric outcomes only. The neonatal outcomes were not analysed because the notes for the neonates were held separately and incomplete, due to the changeover from paper to electronic records. We were therefore able to analyse the following obstetric outcomes: miscarriage, congenital malformation, birthweight by gestation, fetal macrosomia (birthweight >90th centile), spontaneous and iatrogenic preterm birth (<37 weeks of gestation), polyhydramnios (Amniotic Fluid Index of >25 cm), mode of delivery, shoulder dystocia, stillbirth and maternal complications. During the study, gestational hypertension was defined as systolic blood pressure  $\geq 140$  mmHg and/or diastolic blood pressure  $\geq 90$  mmHg in a previously normotensive pregnant woman who is  $\geq 20$  weeks of gestation and has no proteinuria. Pre-eclampsia was referred to as the new onset of hypertension and proteinuria after 20 weeks of gestation in a previously normotensive woman. Birthweight of <10th centile was considered small for gestational age. The birthweight percentiles for gestational age were plotted against the percentile charts.<sup>3</sup> Twin pregnancies were excluded from the study.

Gestational diabetes was diagnosed using the current Australian Diabetes in Pregnancy Society recommendations;<sup>4</sup> a routine screening with nonfasting 50 g glucose challenge test is carried out at around 26–28 weeks gestation and

*Correspondence:* Dr Dharmesh Kothari, Department of Obstetrics and Gynaecology, Royal Hobart Hospital, Liverpool Street, Hobart, TAS 7000, Australia.  
Email: dharmesh.kothari@dhhs.tas.gov.au

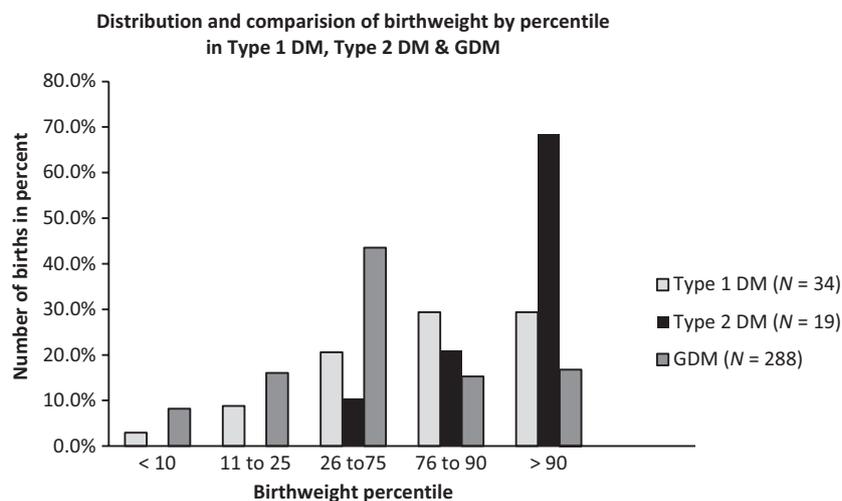
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**Table 1** Comparison of outcomes in pregnancies affected by type 1 DM, type 2 DM and Gestational diabetes (GDM) ( $N = 341$ )

	Type 1 DM ( $n = 34$ )	Type 2 DM ( $n = 19$ )	GDM ( $n = 288$ )
Small for gestational age (birthweight <10th centile)	1 (3%)	0%	22 (7.6%)
Polyhydramnios (Amniotic Fluid Index >25 cm)	2 (5.8%)	4 (21.1%)	7 (2.4%)
Gestational hypertension/Pre-eclampsia	9 (26.8%)	4 (21.1%)	35 (12.2%)
Preterm birth (<37 weeks of gestation)	13 (38.2%)	8 (42%)	48 (16.7%)
Induction of labour	15 (47%)	7 (37%)	126 (44%)
Caesarean birth	18 (52%)	13 (68%)	106 (34.7%)
Shoulder dystocia*	5 (31.2%)	1 (16.5%)	11 (5.9%)

\*Shoulder dystocia rate expressed as per cent of vaginal births.

DM, diabetes mellitus.

**Figure 1** Birthweight percentile by gestational age and gender in singleton pregnancy.<sup>4</sup>

those whose blood glucose  $\geq 7.8$  mmol/L at 1 h are offered a fasting glucose tolerance test with 75 g glucose load. A fasting glucose  $\geq 5.5$  mmol/L and/or 2 h  $\geq 8$  mmol/L are considered diagnostic for gestational diabetes. Self-monitoring of blood glucose was recommended three times a day, and treatment targets of fasting  $< 5.5$  mmol/L and 2 h postprandial  $< 7$  mmol/L were used during the study period.

## Results

A search of around 10 000 birth records revealed 361 pregnancies which matched the keywords entered. These occurred in 306 women during the period of review. Of the 361 electronic case notes identified, 10 cases were excluded because they were referred from other units antenatally and repatriated back to their base units for delivery. The outcomes for 351 pregnancies were analysed. Forty-four of the pregnancies in 30 women had type 1 diabetes, 19 pregnancies in 14 women had type 2 diabetes mellitus, and 288 pregnancies in 262 women were diagnosed with gestational diabetes based on the criteria described.

### *Type 1 diabetes mellitus*

Of the 44 pregnancies with type 1 diabetes, eight (18%) resulted in spontaneous miscarriage before 12 weeks of gestation. One pregnancy was terminated at 13 weeks for monosomy X (45 X0), and one pregnancy was terminated at 21 weeks for retrognathia (4.5% fetal abnormality rate). Pregnancy outcomes in type 1 diabetes are shown in Table 1.

Of the remaining 34 pregnancies, 15 women (47%) underwent induction of labour. The majority of women in this group (55.8%) were delivered between 37 and 39 weeks gestation as per unit protocol.

Six (17%) women underwent elective caesarean section, and 12 (35%) were delivered by emergency caesarean section, making a total caesarean section rate of 52% for the type 1 diabetics. Of 16 women delivered vaginally, five (31.2%) were recorded to have been complicated by shoulder dystocia and one infant had Erb's palsy which resolved with conservative management.

The birthweight of 29.4% of infants was greater than the 90th centile (Fig. 1). There were no stillbirths noted for this group during this period of time.

## ***Type 2 diabetes mellitus***

All the 15 women with 19 pregnancies affected by type 2 diabetes mellitus were treated with insulin during the pregnancy. There was no recorded case of oral hypoglycaemic usage in this group. There was one (5.3%) still birth, and one (5.3%) pregnancy was complicated by occipital meningocele (known during the antenatal period) and was delivered at 36 weeks of gestation with a birthweight of 4106 g. Pregnancy outcomes in type 2 diabetes are shown in Table 1.

The majority of women (52.5%) with type 2 diabetes were delivered at term, that is, between 37 and 40 weeks, and the overall caesarean section rate was 68%.

The birthweight distribution showed that 47.3% of neonates were >97th percentile and 21.05% were between 91st and 97th percentiles. Shoulder dystocia was recorded in two (16.5%) women who delivered vaginally (Fig. 1).

## ***Gestational diabetes (GDM)***

There were 288 pregnancies from 262 women who were diagnosed to have gestational diabetes. One hundred and twenty-six (43.8%) were managed with diet alone and 12 (4.2%) were treated with metformin. The remaining 150 (52.1%) received insulin for glycaemic control during the course of pregnancy. There were no stillbirths noted in this group. Shoulder dystocia occurred in 11 (5.9%) women who delivered vaginally (Table 1). Birthweight centile for sex and gestation are shown in Figure 1.

## **Conclusion**

The results from this study are in accord with the findings from the literature that obstetric outcomes for type 2 diabetes in pregnancy remain poorer (Table 1) when compared with women with type 1 or gestational diabetes. Fetal macrosomia was observed at a higher rate with type 2 diabetes, that is, in 68.8% compared with 29.4% in type 1 diabetes and 16.8% in gestational diabetes. A strong association between fetal macrosomia and other adverse outcomes such as caesarean section, shoulder dystocia and birth trauma<sup>5</sup> was also evident in this study.

We recognise the limitations associated with a retrospective study of this nature and the unavailability of neonatal outcomes. The cohort assessed was small, and consequently, the breakdown of women with type 1 and type 2 diabetes in pregnancy was small. However, this study has shown that whilst the obstetric outcomes for gestational diabetes are generally good, this reflects the close monitoring and care that the women receive at the combined clinic. Women with type 2 diabetes often have other comorbidities, that is, obesity and other co-morbidities such as thyroid or renal disease. Many have limited access to pre-pregnancy counselling or care that may be available from their local general practitioners (GPs), or their

socioeconomic status may have an influence on their lifestyle and dietary choices. Ideally, many of these factors can be modified by appropriate and timely pre-pregnancy counselling.<sup>5</sup> There is a plethora of evidence that directs healthcare services to provide high-quality preconception care. Despite this, there remains an incongruent approach to preconception service provision for women and more importantly for those women with diabetes across the regions.<sup>6</sup>

The International Association of Diabetes in Pregnancy Study Group and the Australasian Diabetes in Pregnancy Society have suggested new screening and diagnostic criteria for gestational diabetes which will increase the rate of diagnosed gestational diabetes and may improve the outcomes. At the same time, there is a change in the demographics of women becoming pregnant and an increase in rate of type 2 DM in the Australian community.<sup>7</sup> Both of these factors will no doubt create an extra burden on our healthcare system, but with outcomes being worse in type 2 diabetes, we believe it is time for us to focus on improving strategies in managing type 2 DM and pregnancy.

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