

Maternal Type 2 Diabetes in Pregnancy: Identifying risk factors for adverse outcome



West Midlands Cohort Results: Pregnancy in Women with type 1 and type 2 diabetes in 2002-2003.

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Introduction

Pregnancies complicated by pre-gestational diabetes are at higher risk of a poor outcome (miscarriage, stillbirth, neonatal death and/or major congenital anomaly) than pregnancies in the general maternity population. In the UK these risks are very similar for maternal type 1 and type 2 diabetes¹. Within the West Midlands (WM) there is a large multi-ethnic population and a higher proportion of mothers are from Asian minorities (17.5% vs 10.5% nationally). This has resulted in an increased incidence of type 2 diabetes in pregnancy in the WM.

This study formed part of the WM region-wide project into maternity care and pregnancy outcomes in women with pre-gestational diabetes which was collected as part of the UK CEMACH national enquiry programme 2002-03¹.

Aims

- Document the demographic and economic characteristics of mothers with type 2 diabetes in WM
- To identify risk factors within this group associated with poor pregnancy outcome
- To assess glycaemic control within this group before and throughout pregnancy

Method

Data Collection

Pre-gestational diabetes was defined as either type 1 or type 2 diabetes, which had been diagnosed at least 1 year before the woman's estimated date of delivery (EDD). The data on each woman was collected any time from booking to delivery between 01-03-2002 and 28-02-2003 and followed to include the outcome of the baby at 28 days post natal. A national standards dataset (SDS) was completed by the lead midwife at the unit attended by the pregnant diabetic woman, during or after the pregnancy, based on documented medical records.

Major congenital anomalies (CA) were coded according to the 10th revision of the International Classification of Diseases and minor anomalies were excluded.

Data from pregnancies with type 2 diabetes was collected and analysed in two groups:

1. **Good pregnancy outcome** (neonate alive at 28 days, no congenital anomaly :n=116),
2. **Poor pregnancy outcome** (fetal or neonatal loss and/or major congenital anomaly : n=33).

Results

Table 1 : Demographic and economic characteristics of the women

	Type 1 (n=269)	Type 2 (n=149)	All (n=418)
Median age of mother at entry to study, Years (IQR)	29 (9)	33 (8)	31 (9)
Ethnicity : (%)			
European	249 (92.6)	64 (43.0)	313 (74.9)
Black African	0	4 (2.7)	4 (1.0)
Black Caribbean	5 (1.9)	12 (8.1)	17 (4.1)
Indian	7 (2.6)	11 (7.4)	18 (4.3)
Pakistani	3 (1.1)	45 (30.2)	48 (11.5)
Bangladeshi	0	7 (4.7)	7 (1.7)
Other	5 (1.9)	6 (4.0)	11 (2.6)
Multiparous (%)	175 (65.1)	128 (85.9)	303 (72.5)
Median age at onset of diabetes, years (IQR)	13 (13.25)	28 (9)	20 (16)
Median duration of diabetes, years (IQR)	14 (13.25)	4 (4)	9 (13)

Index of Multiple Deprivation	Type 1 (n=269)	Type 2 (n=149)	All (n=418)
Quintile 1	43 (16.0)	10 (6.7)	53 (12.7)
Quintile 2	47 (17.5)	14 (9.4)	61 (14.6)
Quintile 3	52 (19.3)	16 (10.7)	68 (16.3)
Quintile 4	48 (17.8)	30 (20.1)	78 (18.7)
Quintile 5	66 (24.5)	79 (53.0)	145 (34.7)

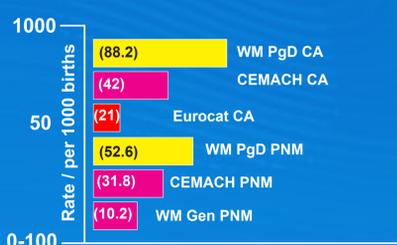
There were 149 pregnancies complicated by maternal type 2 diabetes. 42.3% were in the Asian group with an equal proportion being European. In the two pregnancy outcome groups there was no differences in ethnicity (42% non-European, 58% European), maternal age at delivery, age of diabetes onset, duration of diabetes or parity.

IMD Quintile 5, as identified by home postcode, represents the fifth of highest social and economic deprivation. Similar proportions of non-European women (77-80%) and European women (16-21%) were located in quintile 5 in both good and poor pregnancy outcome groups. Overall half of those women experiencing a poor pregnancy outcome were located in IMD 5.

Table 2 : Pregnancy Outcomes of all type 2 diabetic pregnancies: cohort

	Early Fetal loss <20/40	Late fetal Loss >20-23+6	Stillbirth	Neonatal Death	Alive at 28 days
Poor Outcome	13	8	2	9	33
Congenital Anomalies	1	1	1	9	12
Good Outcome	0	0	0	116	116
Total					149

Fig 1 : Congenital Anomaly/Perinatal Mortality Rate Data 2002-03



The major congenital malformation rate for type 2 diabetic pregnancies is 88.2/1000 births, with the highest rate being seen in the European group.

The PNMR is 52.6/1000 births with the highest rate being seen in the Non-European group.

Use of Insulin

32% of all type 2 diabetic women were taking insulin prior to the pregnancy but this was statistically more likely in those women with a poor pregnancy outcome (48.5% vs 27.6%, p=0.04).

56% commenced insulin at a first hospital appointment, most usually in the first trimester.

Glycaemic Control

Table 3: Comparison of pregnancy outcomes and mean HbA1c values during pregnancy

HbA1c Values	Poor outcomes N = 33			Good Outcomes N = 116			P value**
	[N]	Mean	(SD)	[N]	Mean	(SD)	
Total Cohort							
Pre-pregnancy	[10]	9.0%	(3.0)	[39]	7.2%	(2.2)	0.13
10 week	[24]	7.7%	(1.4)	[87]	6.7%	(1.4)	<0.01*
20 week	[18]	6.4%	(1.2)	[103]	6.1%	(1.2)	0.31
34 week	[12]	6.8%	(1.2)	[104]	6.2%	(1.0)	0.03*
European							
Pre-pregnancy	[6]	7.4%	(2.2)	[24]	7.1%	(1.7)	0.92
10 week	[8]	7.1%	(0.6)	[37]	6.6%	(1.3)	0.20
20 week	[7]	5.9%	(0.8)	[43]	5.8%	(1.0)	0.66
34 week	[6]	6.3%	(1.0)	[45]	6.1%	(1.0)	0.66
Non-European							
Pre-pregnancy	[4]	11.4%	(2.5)	[15]	7.4%	(2.9)	0.02*
10 week	[16]	8.0%	(1.2)	[50]	6.7%	(1.5)	<0.01*
20 week	[11]	6.7%	(1.4)	[60]	6.3%	(1.2)	0.33
34 week	[6]	7.3%	(1.2)	[59]	6.2%	(1.1)	0.02*

* Statistical significance

**P value used - Mann Whitney or T-test as appropriate

Discussion

Women with type 2 diabetes in WM show very different demographic and economic characteristics to those with type 1 diabetes. Type 2 diabetic mothers are older (median age 33 yrs), multiparous (78%), predominantly of Asian ethnicity (43%) and living in areas of greatest social deprivation (IMD 4+5 73%). However there was no significant differences in these characteristics between those type 2 pregnancies resulting in a good or poor pregnancy outcome.

The congenital malformation rate is ~2 times that of the UK national dataset and 4 times that of the general maternity population. The majority of these anomalies occurred in the European group resulting in the highest CA rate by ethnicity (110/1000 births)

The perinatal mortality is ~5 times that of the WM general maternity population over the same time period². By contrast, this risk is highest in non-Europeans (RR 2.5).

Poor Pregnancy outcomes in type 2 pregnancies are associated with:

- the need for pre-pregnancy insulin for glycaemic control
- significantly poorer glycaemic control assessed in the first and third trimesters (HbA1c)
- significantly poorer glycaemic control in pregnancy in the non-European groups

There is likely to be an array of reasons causing the increased risks of fetal and neonatal loss and/or congenital anomaly in type 2 diabetic women. Poorer access to medical services, particularly pre-pregnancy counselling clinics and advice and late antenatal hospital booking or referral for specialised antenatal care are known to affect women with type 2 diabetes, particularly where language barriers exist. In addition we observed increased rates of co-morbidities (eg asthma, depression) in this group. The strong association between poor glycaemic control and higher CA and PNM rates has been documented in other studies, mainly in type 1 diabetics. We demonstrate this association in type 2 diabetic women particularly in relation to poor glycaemic control in early pregnancy and in non-Europeans. Improved glycaemic control throughout pregnancy but especially in the first trimester and in non-European (Asian) groups is vital in reducing the risk of perinatal loss and/or fetal congenital malformations.

Conclusions

Type 2 diabetic mothers in WM have a significantly higher perinatal mortality and congenital malformation rate compared to the regional general maternity population. Identification of risk factors and improved glycaemic control should assist efforts to improve outcomes in this group.

References

1. Confidential Enquiry into Maternal and Child Health: Pregnancy in women with type 1 and type 2 diabetes in 2002-2003, England, Wales and Northern Ireland, London CEMACH, 2005.
2. West Midlands Prenatal Mortality 2002-03 (Update March 2005), West Midlands Perinatal Institute.