The Multidisciplinary Management of Type 2 and Gestational Diabetes in Pregnancy

Abstract

The UK is experiencing a dramatic increase in prevalence of type 2 diabetes mellitus (T2D). Consequently there is a corresponding increase in diabetes in pregnancy, with 87.5% of the pregnancies complicated by diabetes due to GDM and 27% of those with pre-existing diabetes having T2D. Although the risks to mother and baby are similar to type 1diabetes (T1D), the approach and management often differ. Women with GDM and T2D are more likely to be older, multiparous and live in deprived areas. Certain ethic groups are more prone to GDM and T2D and there is a strong association with being overweight and obesity. Women who develop GDM in pregnancy have an increased risk of T2D in later life. Some surveys have shown that women with T2D often receive suboptimum care prior to conception and in early pregnancy. This paper presents an overview of the multidisciplinary management of T2D and GDM in pregnancy and identifies areas where care may be lacking for these women.

Introduction

Diabetes is the most common medical disorder affecting pregnancy in the UK with approximately 2 - 5% of pregnant women having diabetes (NICE 2008a). The majority of pregnancies complicated by diabetes are due to gestational diabetes (GDM) (87.5%). GDM develops during the latter half of pregnancy and is caused by increased insulin resistance; some women unknowingly have chronic insulin resistance prior to pregnancy, which is then exacerbated by the physiological changes of pregnancy (Metzger *et al* 2007). Increased production of female hormones in *all* pregnancies leads to increased insulin resistance, resulting in increased demands for insulin. In those women where pancreatic insulin production is unable to meet demand, transient diabetes develops (Buchanan *et al,* 1990; Butte, 2000). Although β-cell production of insulin increases in all pregnancies, those with GDM have lower insulin secretion for their degree of insulin resistance, compared to women with normal glucose tolerance (Metzger *et al* 2007).

The UK is experiencing a dramatic increase in the prevalence of GDM and type 2 diabetes (T2D) in pregnancy as factors other than pregnancy can also increase insulin resistance, predominantly increasing age and increased adipose tissue (Diabetes UK, 2011a). The increasing prevalence of overweight and obesity in pregnancy is largely to blame. The UK is experiencing an increase in T2D in younger people in general, with 1.5% of children with diabetes now reported to have T2D. Prior to 2002, T2D was unknown in children (Diabetes UK 2012b). The Confidential Enquiry into Maternal and Child Health (CEMACH 2007) found that 27% of pregnant women with pre-existing diabetes had T2D. Furthermore, women with T2D were also more likely to be older, multiparous and live in deprived areas. Pregnant women with T2D were more likely to be obese (BMI >30 kg/m^2), with 62% of those with T2D and 15% with type 1 diabetes (T1D) being classed as obese (P<0.001) (CEMACH, 2005). Certain ethnic groups are also more likely to develop GDM or T2D particularly people of African, black Caribbean, South Asian, Middle Eastern and Chinese family origin (NICE 2008a). Women who are diagnosed with GDM have a 30% risk of developing T2D during their lifetime, compared with a 10% risk in the general population (Diabetes UK, 2011a).

Diabetes in pregnancy is classed as a high risk pregnancy as it is associated with a number of complications for both mother and baby (Table 1).

Table 1. Complications of pregnancy associated with different types of diabetes

Complication	**Type of DM**
Maternal Ketoacidosis and hypoglycaemia	Type 2
Miscarriage	Type 2
Genetic malformation	Type 2
Still birth/ Fetal death	Type 2, GDM
Polyhydramnios	Type 2, GDM
Pre-eclampsia	Type 2
Macrosomia/Large for gestational age	Type 2, GDM
Shoulder dystocia/ Birth trauma	Type 2, GDM
Neonatal hypoglycaemia	Type 2, GDM
Induction of labour or caesarean section	Type 2, GDM
Transient neonatal morbidity	Type 2, GDM
Obesity and/or diabetes developing later in the baby's life	Type 2, GDM

(Diabetes UK, 2002; NICE, 2008a).

Table one shows that T2D incurs similar risks as T1D, despite T2D often being viewed as a less serious condition. Women with T2D are more at risk of hypertension during pregnancy (Diabetes UK 2008a). GDM is associated more with complications occurring at the end of pregnancy and during the birth of the baby. CEMACH (2007) found that pregnancy outcomes were equally poor in women with T2D as those with T1D and poor glycaemic control based on HbA1c results in early pregnancy was the most significant risk factor for both congenital malformations and stillbirth. Early diagnosis and access to appropriate multidisciplinary specialist maternity care are essential in achieving good glycaemic control and so limiting risk of complications (Diabetes UK, 2011b).

GDM Diagnosis

NICE (2008a) recommend screening all women to identify those at high risk (table 2). Once identified these women should be tested for GDM using a 2-hour 75 g oral glucose tolerance test (OGTT). Diagnosis is made using the criteria defined by the World Health Organization (WHO) which is a fasting blood glucose > 7 mmol/l and/or a 2 hour blood glucose > 7.8 mmol/l. OGTT should be offered at 24-28 weeks gestation; women with previous GDM should be screened earlier at 16-18 weeks (and again at 28 weeks if first OGTT is normal) (NICE, 2008a).

Table 2: Women at increased risk of GDM who require screening with OGTT

Body mass index (BMI) > 30 kg/m^2
Previous macrosomic baby weighing 4.5 kg or above
Previous gestational diabetes
Family history of diabetes (first-degree relative with diabetes)
Family origin with a high prevalence of diabetes: South Asian (specifically women whose country of family origin is India, Pakistan or Bangladesh) Black Caribbean Middle Eastern (specifically women whose country of family origin is Saudi Arabia, United Arab Emirates, Iraq, Jordan, Syria, Oman, Qatar, Kuwait, Lebanon or Egypt).

(NICE, 2008a)

There is some debate about the use of WHO criteria to diagnose GDM as glucose tolerance changes with duration of pregnancy (Diabetes UK 2011c). Furthermore, different criteria are used in the USA where *all* pregnant women are screened and the diagnosis of GDM is made when *any* of the following plasma glucose values are exceeded:

- Fasting ≥ 5.1 mmol/l
- 1 h ≥ 10.0 mmol/l
- 2 h ≥ 8.5 mmol/l (American Diabetes Association 2012)

Should these criteria be adopted in the UK, the prevalence of women diagnosed with GDM would increase significantly, further increasing the demand for finite specialist resources. However, American clinicians argue that previous criteria would not identify some women at risk of poor pregnancy outcome, as outlined in the Hyperglycaemia and Adverse Pregnancy Outcomes (HAPO) study (Metzger *et al.,* 2008).

Type 2 Diabetes and Pre-conceptional care

Women with pre-existing T2D require advice and support from the Multidisciplinary Team (MDT) regarding planning pregnancy as good glycaemic control at the time of conception and in early pregnancy can reduce the risk of many pregnancy complications (NICE 2008a). Despite this, only about one third of women with T2D access pre-conceptional care (CEMACH 2007).

Women should be advised to access pre-conceptual care with their Diabetes Specialist Nurse to achieve an HbA1c of 6.1% or lower before conception (NICE 2008a) and to aim for the following:

- Blood glucose < 5.6 mmol/l before meals or < 7.8 mmol/l 2 hours after eating.
- Avoid smoking and alcohol.
- Eat a healthy balanced diet.
- Folic acid supplementation of 5 mg/day (higher than the recommended dose for the general population). This should be taken prior to conception and up to 12 weeks gestation.
- Have retinal screening to check for signs of retinopathy
- Check blood pressure.

- Check medication as some medications commonly used in T2D are contraindicated in pregnancy, e.g. statins, angiotensin-converting enzyme (ACE) inhibitors or angiotensin-11 receptor antagonists. Also oral hypoglycaemic agents (OHA) other than Metformin e.g. Glibenclamide, need to be replaced with either Metformin or insulin.

(Diabetes UK 2006; Diabetes UK 2011d; NICE 2008a).

Women should also have a review by the specialist midwife within the MDT where positive pregnancy information can be given; the rubella status can be reviewed; advice about stopping alcohol consumption, starting folic acid and help to stop smoking can be made. Moreover, a realistic plan can then be made about when to advice women to stop using contraception.

Role of the Multidisciplinary Team

CEMACH (2007) found preconception care lacking for many pregnant women with diabetes, particularly those with T2D (25% T2D compared to 38% T1D). Less than a fifth (17%) of maternity clinics offered a structured, maternity multidisciplinary service. According to medical records less than half of women were taking folic acid supplements, with only a minority taking the correct dose of one 5 mg tablet per day. Folic acid supplementation was lower for women with T2D (29% compared to 43% T1D). Less than half of women had been advised about glycaemic control, diet, contraception, complications and alcohol prior to pregnancy. Two thirds of women (79%) had suboptimal glycaemic control prior to conception, despite this only a minority were documented to be using contraception and only 54% had $HbA1^C$ recorded in the 12 months prior to pregnancy.

As a result a number of recommendations were made aiming to improve preconception care, in particular, ensuring that all women with diabetes have access to all members of the specialist multidisciplinary team (MDT). As a minimum this should include an obstetrician; a diabetes physician; a diabetes specialist nurse; diabetes specialist midwife and a dietitian. (CEMACH, 2007; DOH, 2001). In 2012 Diabetes UK published a list of '15 Essentials' regarding diabetes care. One of these essentials (13) is access to specialist care when pregnant or planning pregnancy (Diabetes UK 2012a).

It was also acknowledged that less than half of women with diabetes had a planned pregnancy with only 27% reported to be using contraception prior to pregnancy (CEMACH 2007). Therefore, preconception care and adequate contraceptive provision should be a key aspect of general diabetes care, both in primary and secondary care, for all women of child bearing age from adolescents onwards (DOH 2003). This is particularly true for women with T2D as many have their diabetes care within primary care settings.

Antenatal care

Pregnant women with T2D require immediate referral to all members of the specialist MDT as soon as pregnancy is confirmed (NICE 2008a). Ideally all members of the MDT will be in clinic at the same time and each speciality will be recognised and valued for their unique contribution to care during pregnancy. CEMACH (2007) found that only one fifth of women had all members of the MDT involved in their care. Women with diabetes require additional care over and above routine antenatal care (as outlined by NICE 2008b). In particular,

frequent contact with the MDT is essential to ensure relevant education and updated information is provided. NICE (2008a) recommends appointments every 1-2 weeks throughout pregnancy primarily to monitor and assess glycaemic control if there are no significant complications of diabetes present. If there are significant complications an individualised plan of care should be made with women being seen weekly or more often if necessary.

NICE (2008a) provides very detailed information regarding specific antenatal care for diabetes, highlighting assessments and information that should be provided at each appointment. To summarise, women with T2D and GDM will require individualised advice regarding blood glucose targets and monitoring. Moreover, additional education regarding insulin management is needed, as many will be commencing insulin for the first time and insulin doses change throughout pregnancy (Rayburn *et al* 1985). Women taking insulin will require detailed advice regarding preventing and managing hypoglycaemia, particularly if newly commencing insulin, plus detecting and managing ketoacidosis. Both conditions can be more prevalent in diabetic pregnancy and can occur with less warning because of metabolic changes in pregnancy (Rayburn *et al* 1986).

The importance of medical / obstetric assessment during antenatal care for women with T2D should entail the detection and monitoring of diabetic complications such as retinopathy, nephropathy and neuropathy (NICE 2008a). Underlying complications often worsen during pregnancy, particularly if undetected or with poor glycaemic control (Diabetes UK 2011d). These women should be offered a retinal and renal assessment as soon as possible by the diabetes physician at the MDT antenatal clinic, particularly if this has not been performed in the last 12 months. NICE (2008a) detail continuous monitoring of these conditions and indicate when women may need referral for specialist care to manage them.

CEMACH (2007b) found that women aged over 35 years and those with pre-existing medical conditions including hypertension and T2D had greater risk of cardiovascular disease; monitoring with electrocardiograph (ECG) is recommended in these cases. Furthermore, as women with T2D have increased risk of hypertensive disorders in pregnancy and low dose aspirin is known to protect individuals with diabetes against hypertension (Diabetes UK 2009), one 75mg tablet of aspirin is recommended daily from 12 weeks gestation until the birth of the baby.

Role of the midwife

The midwife is a key member of the MDT as the keeper of ‘normality’ within a high risk pregnancy. This role is vital for woman with diabetes so that normal pregnancy information and planning does not get lost within a medical model of care. The diabetes midwives role is crucial in ensuring that women are looked after by a midwife with expert knowledge about diabetes so that problems can be identified and plans can be made within a combined medical and midwifery approach to care. An important aspect of this care is ensuring that women get consistent information from all members of the team based on best evidence.

As poor pregnancy outcome is more prevalent with T2D, additional monitoring and screening of fetal development is essential. Ultrasound scans in early pregnancy for dating (preferably 7 – 9 weeks), the combined test for Down’s screening (10 – 13 weeks) and for fetal anatomy (to include 4-chamber view and outflow tracts at approximately 20 weeks) are used to detect

fetal abnormalities such as heart defects or nuchal fold thickening (NICE, 2008a; Locatelli *et al*, 2000). Later ultrasound scans are used to monitor fetal growth, fetal wellbeing (uteroplacental and umbilical artery doppler) and amniotic fluid volume (NICE 2008a). CEMACH (2007a) found that nearly half of babies with macrosomia did not receive adequate fetal surveillance and this was associated with fetal and neonatal death. Due to increased risk of still birth, tests for fetal wellbeing in GDM and T2D, such as cardiotocographic (CTG) monitoring can be used after 28 weeks gestation when necessary (Polyhydramnios, accelerated growth or risk of IUGR) and all women need detailed advice regarding monitoring of fetal movements (RCOG 2011).

Role of the dietitian

Access to a specialist dietitian is essential to help women achieve the optimum healthy diet for diabetes in pregnancy, especially if new to diabetes (GDM) or new to insulin (T2D). Women will require education to identify sources of dietary carbohydrate, amount of carbohydrate and an awareness of glycaemic index. Some women with GDM manage their diabetes with low sugar diet alone when given appropriate dietary advice and guidance. Pregnant women also require advice regarding food hygiene and foods contraindicated in pregnancy as part of their routine antenatal care (see NHS 2011a; NHS 2011b for details). Specialist dietetic advice can also help if women have additional challenges such as overweight/obesity; hypoglycaemia; severe nausea/vomiting, or if they haven't seen a dietitian before or for some time and their T2D dietary information is outdated. Despite this, CEMACH (2007a) found that less than half of pregnant women with diabetes had access to a dietitian.

Care during labour and birth

Women with pregnancies complicated by diabetes should be offered delivery in a consultant-led unit, with neonatal intensive care available. Women should also have continuous electronic fetal monitoring throughout labour and a paediatrician should also be present at the birth as women have an increased risk of IUGR, macrosomia and instrumental delivery (Diabetes UK 2008). Where possible, the aim is for vaginal delivery but pregnancy problems such as fetal macrosomia or previous caesarean section may indicate a need to consider caesarean section (NICE 2008a). Rates of caesarean section tend to be higher in diabetic pregnancies (Diabetes UK 2008).

Due to the risk of stillbirth, induction of labour or caesarean section is offered between 38 and 39 weeks gestation if pregnancy is progressing with a healthy woman, good glycaemic control and a normally grown fetus (NICE 2008a). Babies who are likely to be delivered earlier than 37 weeks (due to complications such as pre-eclampsia, IUGR, fetal distress) are recommended to have a course of intramuscular corticosteroids (two doses 12 hours apart) for fetal lung maturation to prevent neonatal respiratory distress syndrome. Women with insulin treated T2 and GDM, receiving steroids should be admitted and receive additional insulin and blood glucose monitoring, to prevent maternal hyperglycaemia and possible ketoacidosis (NICE 2008a; Diabetes UK 2008).

Throughout labour and delivery (and caesarean section), blood glucose should be monitored hourly aiming to maintain blood glucose levels between 4-7 mmol/l (NICE 2008a). All women

with T2D should have intravenous dextrose and insulin infusion during established labour, prior to and immediately after caesarean section.

Some consideration may be needed regarding possible hypoglycaemia; that is some flexibility with women expected to be 'Nil by mouth' where oral dextrose tablets could be administered. Women who have required insulin during pregnancy intravenous insulin and dextrose should be considered (Diabetes UK 2008a).

Postnatal care

Once the baby and placenta are delivered there is a sudden reduction in insulin resistance which dramatically reduces the demand for maternal insulin (Abayomi *et al* 2005; Diabetes UK 2008a). The postnatal plan in general for these women should be as follows:

- Women with T2D and GDM who were treated with insulin only during their pregnancy should stop insulin immediately after the birth of the baby.
- Women who were treated with oral hypoglycaemic agents (OHA) before pregnancy should resume their pre-pregnancy dose, however only Metformin and Glibenclamide are recommended during breastfeeding. Other OHA and other medication discontinued during pregnancy should be avoided whilst breastfeeding (NICE 2008a).
- Women who managed GDM or T2D with diet prior to pregnancy but were treated with OHA (Metformin tablets) and diet during pregnancy, should stop Metformin immediately after delivery (Diabetes UK 2008a).
- Those with GDM can also cease blood monitoring.
- All women should be managed as high risk for thromboembolism because of the increased risks of deep venous thrombosis particularly due to obesity, increased age, instrumental delivery or caesarean section (Simpson et al 2001)

The midwives role in minimising postpartum separation of mother and baby is crucial in supporting successful breastfeeding (Haninger and Farley 2001). All midwives should aim to keep babies with their mothers unless there is a clear medical indication for admission to neonatal intensive care unit (NICU). Previously, babies born to women with diabetes were routinely admitted to NICU but this should no longer be the case. Despite this, CEMACH (2007a) found that one third of NICU admissions occurred due to routine diabetes policy.

If women were treated with insulin in pregnancy and particularly if glycaemic control was poor there is a recognised risk of neonatal hypoglycaemia (blood glucose <2.0 mmol/l) (Diabetes UK 2008a). To prevent this, women should be encouraged to feed their baby as soon as possible after birth, ideally by breastfeeding and then every 2-3 hours to maintain baby's blood glucose levels. Diabetes is not a contraindication for breastfeeding and women should be encouraged to breastfeed. This is a key component the role the specialist midwife holds within the MDT by ensuring that women with GDM and T2D have a midwifery perspective to their care during pregnancy and postnatally. This enables women to be prepared for the postnatal period by giving good advice and helping women to understand the importance of breast feeding in reducing the risk of their baby developing diabetes in later life. Research in Finland has shown that exclusive breastfeeding for 2–3 months significantly reduced the risk of children developing T1D (Virtanen *et al*, 1991; Virtanen *et al*, 1992). Furthermore, the risk of developing T2D in the mother can also be reduced by

breastfeeding; researchers in USA found the longer the duration of breastfeeding, the lower the incidence of diabetes (Stuebe *et al*, 2005). Breastfeeding can also contribute to postpartum weight loss (Baker *et al* 2008) which may help in reducing insulin resistance. There is no risk of breastfeeding causing hypoglycaemia in T2D unlike T1D (NICE 2008a).

Prior to discharge women should receive appropriate contraceptive advice. CEMACH (2007a) found that women with T2D were less likely to receive postnatal contraceptive advice than women with T1D. They should also have a postnatal review 6 weeks postpartum either at diabetes clinic or with their GP as long as there are no serious obstetric or medical complications (Diabetes UK 2008a). Women who had GDM should be advised about their increased risk of developing T2D and of increased risk of GDM in subsequent pregnancies (NICE 2008a). They should also receive screening for T2D when planning future pregnancies and on an annual basis using fasting plasma glucose (NICE 2008a; Diabetes UK 2008a). Healthy lifestyle advice focussing on diet, physical activity and optimum BMI may help women reduce their risk of T2D in future (NICE 2008a).

It is possible that some women with GDM may have undiagnosed T2D. Therefore all women with GDM should have an OGTT performed 6 weeks postpartum to clarify this. Currently NICE (2008a) recommends screening with fasting blood glucose (FBG) only, but an audit in Liverpool comparing OGTT to FBG found that 36% of women found to have T2D postnatally would have been missed if FBG alone were used (Spelman *et al* unpublished). Women found to have abnormal OGTT postpartum require appropriate referral for T2D management. Women with pre-existing T2D require referral back to the appropriate diabetes service for routine diabetes care (Diabetes UK 2008a).

Conclusion

Gestational and Type 2 diabetes are becoming more prevalent in pregnancy as overweight and obesity increases in the general population and T2D is now predominantly more common in younger women of child-bearing age. The risks to mother and baby are similar to T1D, yet T2D and GDM are often considered less serious conditions often being managed in primary rather than specialist maternity care. As a result, women with T2D often receive suboptimal preconception care and early antenatal care. Women with T2D and GDM are more likely to have additional complications such as obesity, cardiovascular risks, increasing age and hypertension, therefore specialist care from all members of the multidisciplinary team is essential. Specialist care prior to conception, during pregnancy and in the postpartum period not only helps to reduce complications of diabetes in pregnancy but may also encourage women to make changes to their diet and lifestyle, improving health in the long term.

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