

An overview of the management of diabetes from pre-conception, during pregnancy and in the postnatal period

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ABSTRACT

Diabetes is one of the most common medical conditions complicating pregnancy. Both pre-existing diabetes and gestational diabetes are associated with increased risks to the mother and fetus. These risks can be reduced by improving pre-conception and antenatal care.

Pre-conception planning and care is important to ensure women are taking high dose folic acid, to optimise glucose control, to review medications and to screen for and manage any complications.

All women with either pre-existing diabetes or gestational diabetes should be reviewed by the antenatal team every 1–2 weeks throughout pregnancy. This is to optimise glucose control and to monitor fetal growth and development.

Women with diabetes in pregnancy should receive an individualised care plan for delivery. The exact timing of delivery will depend on maternal glucose control, fetal growth and any other complications.

Women diagnosed with gestational diabetes in pregnancy are at high risk of developing both gestational diabetes and type 2 diabetes in the future. After delivery, they should be offered a fasting plasma glucose at 6 weeks or a glycated haemoglobin (HbA1c) at 13 weeks to ensure that the gestational diabetes has resolved and an annual HbA1c.

Introduction

In 2018, 3.8 million people in the UK had a diagnosis of diabetes and an estimated 1 million had diabetes but were yet to be diagnosed.¹ Approximately 90% of people with diabetes have type 2 diabetes, 8% have type 1 diabetes and the remainder have another form of diabetes eg genetic diabetes.

Diabetes is one of the most common medical conditions complicating pregnancy. There are approximately 700,000 live births in England and Wales per year and up to 5% of these women have diabetes. The majority of these have gestational diabetes (87.5%) and the remainder have pre-existing diabetes, either type 1, type 2 or another form of diabetes.²

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Both pre-existing diabetes and gestational diabetes are associated with risks to the mother and the fetus (Table 1). These risks can be reduced by improving pre-conception and antenatal care.

This article outlines a practical approach to the management of diabetes from pre-conception, during pregnancy and in the postnatal period.

Pre-conception care

All women with diabetes who are considering pregnancy should receive pre-conception planning and care. This should include the following.

Folic acid

Women with diabetes who are planning pregnancy should take folic acid (5 mg/day) until 12 weeks gestation.⁶ Folic acid reduces the risk of neural tube defects.

Key points

Discuss pregnancy with all women with diabetes of reproductive age, and offer pre-conception care to any woman with diabetes who is considering pregnancy.

Optimising glycaemic control before and during pregnancy improves both maternal and fetal outcomes.

All women with diabetes in pregnancy should be reviewed in a joint diabetes antenatal clinic as early as possible in pregnancy.

Women diagnosed with gestational diabetes are at increased risk of developing type 2 diabetes in the future, and should be offered advice on how to reduce this risk.

Any pregnant woman, with any form of diabetes, who presents with hyperglycaemia or is unwell should be tested for ketones to exclude diabetic ketoacidosis.

KEYWORDS: Gestational diabetes, pregnancy, diabetes, intrapartum, antenatal ■

Table 1. Maternal and fetal risks of diabetes in pregnancy.^{2–5}

Maternal	Fetal
Severe hypoglycaemia, particularly during the 1st trimester	Macrosomia resulting in birth trauma and delivery complications, long-term risks of insulin resistance, obesity and type 2 diabetes
Pre-eclampsia	Pre-term delivery
Progression of nephropathy and retinopathy	Neonatal hypoglycaemia
Diabetic ketoacidosis	Neonatal care admission
Caesarean section	Congenital malformations (risk 3–4% in type 1 and type 2 diabetes), ^{3,5} risk increases with increasing 1st trimester HbA1c
Thromboembolic disease	Miscarriage, stillbirth and neonatal death – risk increases with increasing 1st trimester HbA1c ⁴

HbA1c = glycated haemoglobin.

Blood glucose control

Women should be self-monitoring capillary glucose levels. Pre-conception capillary glucose target ranges for all types of diabetes are the same as those recommended for all people with type 1 diabetes providing these can be achieved safely. The recommended targets are:

- > a fasting plasma glucose level of 5–7 mmol/L
- > a plasma glucose level of 4–7 mmol/L before meals at other times of the day.⁷

Women trying to conceive should be offered a monthly measurement of their glycated haemoglobin (HbA1c) level and supported to aim for an HbA1c below 48 mmol/mol (6.5%), if this is achievable without problematic hypoglycaemia.⁶ Women with an HbA1c above 86 mmol/mol (10%) should be advised not to get pregnant.⁶

Medication

Metformin is widely used for the management of diabetes before and during pregnancy and lactation. There is strong evidence for its effectiveness and safety but the summary of product characteristics (SPC) states that metformin should not be used and women should use insulin to manage their diabetes.⁸ Despite this, recommendations are to continue metformin pre-conception and in the antenatal period. All other oral blood glucose lowering medications should be discontinued.

Isophane insulin (eg Humulin I, Insulatard) is recommended as the first choice for women with diabetes,⁶ however many women continue long acting insulin analogues (eg Levemir, Lantus) during pregnancy. Rapid acting insulin analogues (eg Novorapid, Humalog) are safe in pregnancy and should be continued.

Angiotensin converting enzyme inhibitors and angiotensin-II receptor antagonists should be discontinued before pregnancy as they have been associated with congenital malformations

including skull defects and oligohydramnios.⁹ Alternative antihypertensive agents (for example labetalol, methyldopa or nifedipine) should be used. Although statins have not been shown to cause significant teratogenic effects, recommendations are that these should be discontinued before pregnancy.¹⁰

Retinal assessment

Women should be offered retinal assessment at their pre-conception appointment, unless they have had annual retinal assessment in the last 6 months.⁶

Renal assessment

Women should be offered renal assessment, including measurement of albuminuria. Women should be referred to a nephrologist if any of the following apply:

- > serum creatinine is >120 µmol/L
- > urinary albumin:creatinine ratio is >30 mg/mmol
- > estimated glomerular filtration rate is <45 mL/min.⁶

Gestational diabetes

Gestational diabetes is defined as hyperglycaemia identified at any time during pregnancy in a woman that is not known to have pre-existing diabetes. In the majority of women, it resolves after pregnancy however it may be the first presentation of type 1, type 2 or genetic diabetes. Uncontrolled, it is associated with an increased risk of adverse birth complications, eg shoulder dystocia.

In the UK, the National Institute for Health and Care Excellence (NICE) recommends that all women undergo a risk assessment for gestational diabetes at booking.⁶

Women with any one of the risk factors in Box 1 should be offered testing for gestational diabetes at 24–28 weeks gestation.⁶

A 2 hour 75 g oral glucose tolerance test (OGTT) is used to test for gestational diabetes in pregnancy. Diagnostic criteria vary between countries however, NICE recommend that gestational diabetes is diagnosed if the woman has either:

- > a fasting glucose level of 5.6 mmol/L or above
- > 2 hour post meal glucose level of 7.8 mmol/L or above.⁶

All women diagnosed with gestational diabetes should be reviewed in a joint diabetes and antenatal clinic within 1 week of diagnosis. The diagnosis of gestational diabetes should be explained and women should be taught self-monitoring of capillary blood glucose.

Women are advised to monitor fasting and 1 hour post meal glucose levels. Capillary glucose targets are the same as for women with pre-existing diabetes (see Box 2).

Box 1. Risk factors for gestational diabetes

- > Body mass index above 30 kg/m².
- > Previous macrosomic baby weighing 4.5 kg or above.
- > Previous gestational diabetes.
- > Family history of diabetes (first degree relative with diabetes).
- > Minority ethnic family origin with a high prevalence of diabetes.

Box 2. Blood glucose targets in pregnancy

- > Fasting glucose level below 5.3 mmol/L and either
 - > 1 hour post meal glucose level below 7.8 mmol/L
 - > 2 hour post meal glucose level below 6.4 mmol/L
- > Glucose levels should be above 4 mmol/L in women on insulin.

Treatment for gestational diabetes includes dietary modification and advise on regular exercise eg walking for 30 minutes after a meal to improve blood glucose control.⁶

Women should be reviewed every 1–2 weeks by a member of the diabetes antenatal team. If capillary glucose targets are not met using changes in diet and exercise, women should be offered metformin initially and then insulin if required.

Antenatal care

Women with diabetes should be seen as early on in pregnancy as possible, in a joint diabetes and antenatal clinic. Women should be offered contact with the joint diabetes antenatal team (either face to face or virtual clinic appointments) every 1–2 weeks throughout pregnancy.⁶

Blood glucose control

At booking, all women with pre-existing diabetes should have an HbA1c measured.⁶ This determines the level of risk for the pregnancy.³ This can be repeated in the 2nd and 3rd trimester. HbA1c should be measured in all women with gestational diabetes to identify those with pre-existing diabetes.⁶

Women with type 2 diabetes or gestational diabetes managed with diet or metformin are advised to measure fasting and 1 hour post meal glucose levels daily during pregnancy (five tests a day).⁶ Women on insulin are advised to measure their pre-meal levels in addition to the times above (seven tests a day).⁶

NICE recommends the blood glucose targets highlighted in Box 2, if these are achievable without causing problematic hypoglycaemia.⁶

Flash glucose monitoring and continuous glucose monitoring systems are devices that enable people with diabetes to monitor interstitial glucose levels continuously. The use of these technologies is becoming increasingly widespread and recommendations are that in the future all women with type 1 diabetes will have access to continuous glucose monitoring in pregnancy.¹¹ These devices enable women to monitor glucose levels more frequently and studies have shown improved neonatal outcomes when used by women with type 1 diabetes in pregnancy.¹²

Ketone testing and diabetic ketoacidosis

Diabetic ketoacidosis can result in significant morbidity and mortality for both mother and fetus. Women with type 1 diabetes should have access to blood ketone testing strips and should be advised to test for ketonaemia if they are hyperglycaemic (capillary glucose >11 mmol) or unwell.⁶ Women with any form of diabetes who present with hyperglycaemia should be tested for capillary ketones to exclude diabetic ketoacidosis.⁶

Retinal assessment

Women should be offered retinal assessment at their first antenatal clinic appointment and again at 28 weeks,⁶ as

pregnancy is associated with both the development and progression of retinopathy.¹³ Women with retinopathy should receive an additional retinal assessment at 16–20 weeks.⁶ Duration of diabetes, baseline level of retinopathy, glycaemic control and hypertension all influence the development and progression of retinopathy in pregnancy.¹³

Renal assessment

Women should be offered renal assessment at their first antenatal clinic appointment and be referred to a nephrologist if they meet any of the criteria outlined above.

Fetal assessment

In addition to routine antenatal care, women with pre-existing diabetes should be offered a fetal echocardiogram at 20 weeks.⁶ From 28 weeks onwards, women with diabetes (pre-existing and gestational) should be offered ultrasound monitoring of fetal growth and amniotic fluid every 4 weeks.⁶

Intrapartum care

Women with diabetes should be offered an individualised care plan. This should be discussed and agreed with the woman, diabetes team and obstetric team during the 3rd trimester of pregnancy.

NICE recommends advising women with pre-existing diabetes and no other complications to deliver between 37+0 and 38+6 weeks gestation.⁶ The exact timing will depend on maternal glucose control, fetal growth and any other complications. Women with gestational diabetes are advised to deliver no later than 40+6 weeks gestation.⁶

Blood glucose control

Neonatal hypoglycaemia (glucose <2.5 mmol/L) results from excessive fetal insulin production as a result of maternal hyperglycaemia. Therefore during labour glucose levels should be controlled in order to minimise this risk. Capillary glucose levels should be monitored hourly once women are in established labour and the aim should be to keep blood glucose levels between 4 and 7 mmol/L.¹⁴

Labour wards and delivery units treating women with diabetes in pregnancy, should have guidelines on how to manage glucose levels during labour and delivery. NICE recommend using variable rate insulin infusions (VRII) in women whose capillary glucose level is not within target⁶ and suggest considering its use in all women with type 1 diabetes at the onset of established labour. VRII is usually recommended for women undergoing caesarean section. Women should continue their basal insulin during labour, but should stop bolus insulin if a VRII is started.

Continuous subcutaneous insulin infusion or insulin pump

Many women with diabetes, particularly those using continuous subcutaneous insulin infusion pumps (CSII) prefer to manage their own diabetes, without the use of a VRII. Providing glucose levels are with the target range, they should be supported to do this.

Continuous glucose monitors

The use of continuous glucose monitors (CGM) in pregnancy is increasing, however these are not as accurate as capillary glucose

monitors, particularly when glucose levels are changing rapidly or if a woman becomes unwell. Therefore, during labour and delivery women should be advised to use capillary glucose testing.

Postpartum care

Women with pre-existing diabetes should reduce their insulin to pre-pregnancy doses immediately following birth. Women are advised to monitor capillary glucose levels closely as they are at high risk of hypoglycaemia, particularly if breast feeding. Further insulin dose reductions of up to 50% are often required. Women on metformin prior to pregnancy can continue this in the postnatal period and when breast feeding. Women should continue to be monitored by their routine diabetes care provider.

Women with gestational diabetes should discontinue diabetes medications immediately following birth. They should be advised of the future risk of gestational diabetes and type 2 diabetes. Offer women either a fasting plasma glucose at 6 weeks or an HbA1c at 13 weeks to ensure that the gestational diabetes has resolved.⁶ Women diagnosed with gestational diabetes should be offered an annual HbA1c.⁶ ■

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