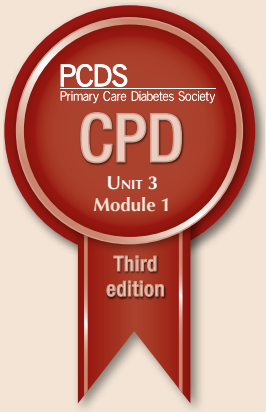
UNIT 3 Special care groups

A practical guide to pregnancy complicated by diabetes



Eoin Noctor, Fidelma Dunne

As the prevalence of diabetes is increasing, so the number of pregnancies complicated by pre-existing diabetes or gestational diabetes is also rising. This presents a challenge to healthcare services in the UK to prevent adverse outcomes in babies born to mothers with diabetes. Clinicians in primary care have an important role to play, particularly in delivering preconception care for women with these conditions. This article discusses the pathophysiology and treatment of both gestational and pre-existing diabetes during pregnancy and outlines the ideal preconception care pathway, as well as antenatal and obstetric care.

Approximately 5% of pregnancies in England and Wales are complicated by diabetes, and so a comprehensive understanding of the challenges faced in such pregnancies is vital. Gestational diabetes (GDM) accounts for the majority (almost 90%) of cases of diabetes during pregnancy, and has been shown to affect up to one in four pregnancies in some cohorts (Lawrence et al, 2008, Hartling et al, 2012; Sacks et al, 2012; O'Sullivan et al, 2011), although prevalence varies widely depending on the diagnostic criteria used. Pregestational diabetes (pre-existing type 1 and type 2 diabetes) affects 0.5–1% of pregnancies in England and Wales (NICE, 2015).

Despite improvements in glycaemic control over recent decades, rates of adverse pregnancy outcome in women with pre-existing type 1 and type 2 diabetes, although greatly improved, remain significantly elevated compared with the background population. Neonatal deaths and stillbirths remain more common in women with diabetes than in the general population (Evers et al, 2004; Dunne et al, 2009; NHS Digital, 2015), although there has been a reduction in the number of stillbirths over the last decade or so (NHS Digital, 2015; Owens et al, 2016). In addition, congenital anomalies, pre-term birth and pre-eclampsia occur more frequently in women with type 1 or type 2 diabetes. Adverse pregnancy outcome is related to periconception HbA_{1c} (Jensen et al, 2009; Owens et al, 2012).

The most recent classification for GDM was defined by the International Association of Diabetes and Pregnancy Study Groups (IADPSG; IADPSG Consensus Panel et al, 2010), who redefined classification into two groups: overt diabetes and GDM. These guidelines have subsequently been adopted by multiple national and international health bodies. However, the most recent NICE (2015) guidelines recommend a lower fasting plasma glucose (FPG) diagnostic threshold (*Table 1*).

Both the IADPSG and the current NICE

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Learning objectives

After reading this article, the participant should be able to:

1. Identify risk factors for the development of gestational diabetes.
2. Describe the ideal preconception clinic and the optimum care that a pregnant woman with pre-existing diabetes should receive.
3. Discuss the available treatment options for pregnant women with either gestational, type 1 or type 2 diabetes.
4. Describe the obstetric management of a pregnancy complicated by diabetes.

Key words

- Gestational diabetes
- Preconception care
- Pregestational diabetes

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Author details can be found on page 41.

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Table 1. Diagnostic criteria for gestational diabetes recommended by NICE (2015) and IADPSG* (2010).

Diagnose gestational diabetes if the woman has either:

NICE (2015)

Test	Threshold
Fasting plasma glucose	≥5.6 mmol/L
2-hour plasma glucose	≥6.4 mmol/L

IADPSG (2010)

Test	Threshold
Fasting plasma glucose	≥5.1 mmol/L
1-hour plasma glucose	≥10.0 mmol/L
2-hour plasma glucose	≥8.5 mmol/L

*International Association of Diabetes and Pregnancy Study Groups

Page points

1. During normal pregnancy, insulin sensitivity decreases with advancing gestation.
2. Women who develop gestational diabetes also increase insulin secretion to compensate for the demands of pregnancy.

criteria were based heavily on the results from the multi-centre HAPO (Hyperglycemia and Adverse Pregnancy Outcomes) trial (HAPO Study Cooperative Research Group et al, 2008). This involved 25 505 pregnant women worldwide and showed a continuous relationship between maternal blood glucose levels and adverse pregnancy outcomes of large for gestational age, pre-eclampsia and caesarean section. This landmark study showed that there was no cut-off value above which the risk of complications rose abruptly; rather, the risk rose steadily even with mean blood glucose values previously considered to be in the normal range. As a result, the IADPSG criteria were developed (diagnostic cut-offs reflect mean blood glucose levels at which the odds ratio for adverse outcome was 1.75) to allow intervention in women who would previously have been categorised as having normal glucose tolerance, but who are at increased risk of an adverse pregnancy outcome. The lower fasting and 1-hour glucose thresholds, and the requirement for only a single abnormal value, have predictably resulted in an increase in the number of women diagnosed with GDM worldwide. The NICE (2015) criteria result in fewer women being diagnosed than when the IADPSG criteria are used, but more than when the older criteria (WHO, 1999) are applied.

Risk factors for the development of GDM have been well established (Solomon et al, 1997; NICE, 2015):

- Family history of diabetes in a first-degree relative.
- BMI ≥30 kg/m^2.
- Maternal age ≥30 years.
- Previous unexplained perinatal death.
- Previous GDM.
- Current glycosuria.
- Long-term steroid use.
- Previous delivery of a baby weighing ≥4.5 kg.
- Polycystic ovarian syndrome.
- Polyhydramnios or macrosomia in existing pregnancy.
- Ethnicity associated with a high prevalence of diabetes (African, south or east Asian, Pacific islanders, Hispanic, Middle Eastern or Caribbean).

According to NICE (2015), individuals with any one of the above risk factors (apart from previous GDM) should undergo a 75-g 2-hour oral glucose tolerance test (OGTT) at 24–28 weeks. It should be emphasised that current NICE (2015) guidance recommends against the use of fasting or random plasma glucose, or HbA_{1c} for diagnosis of gestational diabetes, specifying the use of the 75-g OGTT only. However, HbA_{1c} can be useful in detecting women who may have undiagnosed pregestational type 2 diabetes, and so will usually be checked at the time of diagnosis of GDM. NICE (2015) also specifies that women who have had gestational diabetes in a previous pregnancy should be offered a 75-g 2-hour OGTT as soon as possible after booking (whether in the first or second trimester), and a further 75-g 2-hour OGTT at 24–28 weeks if the results of the first OGTT are normal (NICE, 2015). However, waiting until 16 weeks to perform a 75-g 2-hour OGTT is more likely to identify GDM. Universal screening at 24–28 weeks is desirable, as per IADPSG guidelines, and has also recently been recommended by the US Preventive Services Task Force (Moyer, 2014). However, this still varies according to local policies, and it is not currently recommended by NICE (2015). In the absence of universal screening, high-risk criteria based on the above risk factors should be used to guide selective screening.

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Pathophysiology of GDM

During normal pregnancy, insulin sensitivity decreases with advancing gestation (Catalano et al, 1991). Indeed, by the end of pregnancy, even in non-obese women without diabetes, insulin sensitivity is 40% of its preconception value. The normal pancreas responds by increasing insulin production. In spite of this, blood glucose levels are lower than in the non-pregnant state owing to increased glucose use (including fetal consumption), increased glycogen storage and decreased hepatic glucose output. Women who develop GDM also increase insulin secretion; however, in the majority of cases, there is a pre-existing relative beta-cell insufficiency (usually due to obesity and increased insulin resistance [Buchanan et al, 2012]). Therefore, the compensation is inadequate to meet the demands of the increased insulin resistance seen as gestation progresses, and hyperglycaemia ensues.

Rationale for treatment

Persistent maternal hyperglycaemia leads to compensatory fetal hyperinsulinaemia, which also has growth effects (termed the Pedersen hypothesis). This may cause macrosomia, which increases the risk of serious obstetric complications – shoulder dystocia, brachial plexus injury and clavicular fracture. The high levels of fetal insulin may also result in neonatal hypoglycaemia. In addition to these complications, infants of mothers with GDM are also at risk of hypocalcaemia, jaundice and respiratory distress, resulting in more admissions to the neonatal unit. The risk of pre-eclamptic toxaemia, pregnancy-induced hypertension and polyhydramnios is increased in mothers affected by GDM, and delivery by caesarean section is more frequent (O'Sullivan et al, 2011).

The ACHOIS (Australian Carbohydrate Intolerance Study in Pregnancy; Crowther et al, 2005) demonstrated that children of mothers with "mild" GDM (fasting blood glucose <5.3 mmol/L; *n*=1000) who were treated with diet, exercise, blood glucose monitoring and insulin where indicated, were less likely (relative risk, 0.33) to have a serious adverse perinatal outcome (composite outcome of stillbirth, shoulder dystocia, fracture or nerve injury) than those given routine care. Similar results were seen in an American study of 958 women randomised to either usual antenatal care or treatment, which showed a significant reduction in shoulder dystocia, fetal overgrowth, caesarean section and hypertensive disorders (Landon et al, 2009).

GDM treatment is based initially on lifestyle modification, and women should be managed in a combined obstetric–diabetes antenatal clinic. Women with GDM should be educated on the benefits of good glycaemic control during pregnancy for their own health and that of their baby. Weight should be monitored throughout pregnancy to ensure appropriate weight gain, with the Institute of Medicine (2009) guidelines being the most widely accepted criteria.

Women with GDM are advised to check capillary blood glucose measurements regularly – fasting, pre-meals, 1-hour post-meals and at bedtime. Current NICE (2015) guidance recommends a fasting value of <5.3 mmol/L, and either a one-hour value less than 7.8 mmol/L, or a two-hour value less than 6.4 mmol/L. If women fail to meet these targets (i.e. are above target on three or more occasions, despite medical nutritional therapy for 2 weeks), pharmacological therapy is prescribed. Insulin is most commonly used, but oral antihyperglycaemic agents, particularly metformin, are now commonly prescribed, (NICE, 2015; American College of Obstetricians and Gynecologists [ACOG], 2013). Glibenclamide is the first-line treatment in the ACOG guidelines.

Preconception care

A key principle of management of women with type 1 or type 2 diabetes is preconception care (PCC). Structured PCC is delivered by a multidisciplinary team in a dedicated hospital clinic. PCC may be provided and aided by the use of a standardised proforma and a "checklist" style approach (e.g. Seidu and Diggle, 2016). Primary care providers

Page points

1. During normal pregnancy, insulin sensitivity decreases with advancing gestation.
2. Women who develop gestational diabetes also increase insulin secretion to compensate for the demands of pregnancy.
3. However, in the majority of cases, there is a pre-existing relative beta-cell insufficiency.
4. A key principle of management of women with type 1 or type 2 diabetes is preconception care (PCC).
5. Structured PCC takes the form of a dedicated hospital clinic, delivered by a combination of diabetes nurse specialists, midwife specialists, dietitians, endocrinologists or obstetricians.

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1. Optimal glycaemic control as described here is only one aspect of preconception care (PCC); it also offers the opportunity to optimise overall diabetes care.
2. If individuals avail themselves of PCC, there is time to discontinue oral agents and initiate insulin or change regimens.
3. There is also time to re-educate women on the recognition and risks of hypoglycaemia, especially in relation to driving.

are well placed to increase the proportion of women availing themselves of PCC. As such, every diabetes consultation in women of child-bearing age, both in the hospital and in the community, should include a brief but thorough evaluation of plans for pregnancy, potential risks, need for strict glycaemic control and current method of contraception – return visits for updated contraceptive prescriptions could prompt such a discussion.

PCC is associated with a 75% decrease in congenital malformations and a 66% decrease in perinatal mortality, at the expense of an increase in maternal hypoglycaemia (Wahab et al, 2012; Egan et al, 2016). PCC offers the opportunity to optimise diabetes care as early as possible – ideally 3–6 months prior to attempting to conceive – with the aim of achieving an HbA_{1c} level as close to target as possible while avoiding hypoglycaemia. Fasting and pre-meal blood glucose targets to help achieve this are similar to those outlined above in women with diabetes during pregnancy. However, not all women can achieve this target safely, particularly those with hypoglycaemia unawareness, so in these individuals the HbA_{1c} target should be higher. An HbA_{1c} of 48 mmol/mol (6.5%) also appears to be the optimum target, as identified by a secondary analysis of the DAPIT (Diabetes and Pre-eclampsia Intervention Trial; Maresh et al 2015). NICE guidance specifies a target HbA_{1c} of 48 mmol/mol (6.5%) or less before conception, while advising that women with an HbA_{1c} of 86 mmol/mol (10%) or greater should be advised not to get pregnant.

Table 2. Medication and advice for pregnant women with pre-existing diabetes.

Aspect	Type 1	Type 2	Common to type 1 and type 2
Glycaemic control	Change to MDI regimen if appropriate	Stop oral agents* Change to MDI regimen if appropriate	Change to MDI regimen if appropriate
Hypoglycaemia	Education Glucagon	Education Glucagon	Education Glucagon
DKA	Educate regarding ketone monitoring		
Hyperemesis	Insulin management Ketone monitoring	Insulin management	Insulin management

*NICE (2015) guidelines allow for the use of oral agents in some patients.
DKA=diabetic ketoacidosis; MDI=multiple daily injections.

Other aspects of PCC

Optimal glycaemic control as described above is only one aspect of PCC. PCC also offers the opportunity to optimise overall diabetes care. Medications that have known or potential teratogenic effects – particularly angiotensin-converting enzyme inhibitors, angiotensin II receptor blockers and statins (van Gelder et al, 2010) – need to be discontinued. If blood pressure lowering is necessary, methyldopa or labetalol may be used. Advice should also be given with regard to smoking cessation and avoiding alcohol intake.

If individuals avail themselves of PCC, there is time to discontinue oral agents that are unsuitable for use in pregnancy, and to initiate insulin or to change regimens. There is also time to re-educate women on the recognition and risks of hypoglycaemia, especially in relation to driving, and correct self-monitoring of serum ketones. The woman and her partner can be educated on the appropriate use of glucagon. Education with regard to the potential effects of pregnancy on diabetes management also needs to be discussed, such as in the management of hyperemesis gravidarum and when there are signs of diabetic ketoacidosis (it should be noted that diabetic ketoacidosis may occur at lower blood glucose levels than in a non-pregnant woman). *Table 2* summarises medication-related and general advice for women with type 1 or type 2 diabetes.

Neural tube defects are more common (odds ratio between 1.7 and 8.4; Correa et al, 2012) in infants of mothers with diabetes, and all women with pre-existing diabetes should take high-dose (prescription-only) folic acid 5 mg once daily for at least 3 months prior to pregnancy, and up until 12 weeks' gestational age (Medical Research Council Vitamin Study Research Group, 1991; Macintosh et al, 2006).

Many women with pregestational type 2 diabetes will be overweight or obese.

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Obesity is independently associated with adverse pregnancy outcomes for both the mother and the infant and is an independent risk factor for congenital malformations (Owens et al, 2009, 2012; Egan et al, 2014). In the ATLANTIC DIP (Diabetes in Pregnancy) cohort of women with both type 1 (n=80) and type 2 (n=24) diabetes, 50% were overweight (BMI >25–30 kg/m^2) and 18% were obese (BMI >30 kg/m^2; Dunne et al, 2009). PCC with attention to diet and exercise should focus on reducing, and where possible normalising, BMI prior to conception, which can also have an additional beneficial effect on diabetes control (Brewer et al, 2010). This may also help with fertility, which is a potential problem.

One of the key points of PCC is that contraception should be continued until the HbA_{1c} level is at target. In the absence of overt vascular disease (in the presence of which the combined oral contraceptive pill should not be prescribed), contraception choices remain the same as in the general population, subject to the usual cautions and contraindications. The UK Medical Eligibility Criteria for Contraceptive Use (UKMEC, 2016) offers further guidance to providers of contraception regarding who can use specific contraceptive methods safely.

Insulin therapy in the preconception period

During the preconception period, our view is that women with type 1 diabetes are best managed on a multiple daily injection (basal–bolus) regimen, with three pre-meal injections of rapid-acting insulin analogue and one or more injections of intermediate- or long-acting human insulin or insulin analogue, in preparedness for the pregnancy.

In a randomised controlled trial (RCT), the short-acting insulin analogue aspart was shown to be effective and well-tolerated during pregnancy and associated with a significant reduction in hypoglycaemia compared with human short-acting insulin (Mathiesen et al, 2007). The choice of basal insulin varies from person to person. Insulin detemir, also subjected to the rigour of an RCT, appears safe and effective in pregnancy and is increasingly used (Mathiesen et al, 2012). Although insulin glargine has not yet completed RCTs in pregnancy, observational evidence from a large number of pregnancies does not raise any cause for concern. Insulin degludec has not been evaluated for use in pregnancy. Intermediate-acting insulin (for example, neutral protamine Hagedorn [NPH]) remains the basal insulin with the most clinical experience in pregnant women with either type 1 or type 2 diabetes. Women on insulin pump therapy may continue. As pregnancy is associated with changes in insulin resistance, insulin doses will undergo significant changes, so patients should be advised of this. Women trained in structured carbohydrate counting (such as DAFNE [Dose Adjustment For Normal Eating]) may also continue carbohydrate counting, but obviously the ratio of insulin to carbohydrate portion will change.

Non-insulin therapies in the preconception period

To achieve the desired level of glycaemic control, women with type 2 diabetes will generally need to change to insulin in the preconception period, if receiving PCC, or as soon as pregnancy is reported, if not. The use of oral agents in pregnancy is, however, a widely discussed topic. Metformin has been evaluated in an RCT in women with GDM (Rowan et al, 2008) and no safety issues have emerged from that study, or from a follow-up study of infants up to 2 years after index pregnancy (Rowan et al, 2011). Metformin is listed as an option for treatment in NICE (2015) guidelines, and by ACOG (2013) for use in women with GDM. It should be noted, however, that high supplemental insulin use (44%) was needed to maintain adequate glycaemic control in the MiG (Metformin in Gestational diabetes) trial (Barratt et al, 2013).

Glibenclamide has shown effectiveness in GDM with no evidence of excess risk, in small trials (Langer et al, 2000). It is listed

Page points

1. Obesity is independently associated with adverse pregnancy outcomes for both the mother and the infant and is an independent risk factor for congenital malformations.
2. One of the key points of preconception care (PCC) is that contraception should be continued until the HbA_{1c} level is at target.
3. Women with type 2 diabetes will generally need to change to insulin in the preconception period if receiving PCC, or as soon as pregnancy is reported if not.

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Page points

1. Despite the proven benefits of PCC, uptake remains poor.
2. All healthcare providers, both in primary and in secondary care, need to be aware of the adverse outcomes observed in pregnancies complicated by diabetes and the vast potential for reducing these adverse events through structured PCC.
3. Insulin is the pharmacological treatment of choice in women with diabetes during pregnancy.

as an option for treatment of GDM by ACOG (2013), and in the NICE (2015) guidelines as an option for women who meet criteria for insulin therapy but decline. However, three meta-analyses (Poolsup et al, 2014; Balsells et al, 2015; Jiang et al, 2015) have shown worse outcomes in women with GDM taking glibenclamide than in those taking metformin or insulin. Metformin and glibenclamide have shown placental transfer, although studies have been conflicting in glibenclamide (Langer et al, 2000; Hebert et al, 2009). Therefore, the risks and benefits of these treatments should be discussed fully with patients prior to commencing therapy. Other sulfonylureas, and other classes of antidiabetes medication (e.g. acarbose, dipeptidyl peptidase-4 inhibitors, glucagon-like peptide-1 receptor agonists, meglitinides, sodium–glucose cotransporter 2 inhibitors and thiazolidinediones), are not approved for use during pregnancy.

Uptake of PCC

Despite the proven benefits of PCC, uptake remains poor. A recent UK study found that only 27% of eligible people availed themselves of PCC (Murphy et al, 2010). Our local data show that women with pre-existing diabetes remain unprepared for pregnancy, with 49% conceiving with an HbA_{1c} level of >53 mmol/mol (>7%), while only 43% were on folic acid preconception (Dunne et al, 2009). Follow-up from this cohort has demonstrated that introducing specialist-led care improved the proportion of women attending for PCC (from 28% to 52%). An improvement in glycaemic control and a decrease in the perinatal mortality rate were also noted (Owens et al, 2012; Owens, 2016; Egan, 2016). All healthcare providers, both in primary and in secondary care, need to be aware of the adverse outcomes observed in pregnancies complicated by diabetes and the vast potential for reducing these adverse events through structured PCC.

Diabetes-related complications

Retinopathy, nephropathy, neuropathy, thyroid disease and cardiovascular disease are considered in the module's first version (Noctor and Dunne, 2011).

Antenatal care

Glycaemic control

As stated above, insulin is the pharmacological treatment of choice in women with diabetes during pregnancy. Insulin is uptitrated weekly to reach the desired glycaemic targets, and it should be emphasised that insulin doses need to rise progressively as a consequence of increasing insulin resistance. In addition to self-monitoring of blood glucose, NICE (2015) now advises considering measuring HbA_{1c} levels in the second and third trimesters of pregnancy for women with pre-existing diabetes to assess the level of risk for the pregnancy, rather than on a 2- to 4-weekly basis as HbA_{1c} levels during pregnancy can be unreliable. Trimester-specific ranges are more appropriate to better inform the management of pregnancies complicated by diabetes. Some published trimester-specific HbA_{1c} reference ranges for women with diabetes are: first trimester, 24–36 mmol/mol (4.3–5.4%); second trimester, 25–35 mmol/mol (4.4–5.4%); and third trimester, 28–39 mmol/mol (4.7–5.7%; O'Connor et al, 2011).

All plans for delivery should be clearly documented prior to delivery in the patient record. Women with GDM can stop insulin or other pharmacological therapy on delivery of the placenta, with blood glucose monitoring being recommended for 24 hours afterwards.

It should be noted also that peripartum insulin infusion will be required for women taking insulin during pregnancy. When resuming therapy post-partum, women on insulin preconception can return to their normal doses. Breastfeeding women, however, require either more carbohydrate or a 25% reduction in the preconception insulin regimen.

With regard to oral antihyperglycaemic agents, current NICE guidance states that women with pre-existing type 2 diabetes who are breastfeeding can resume or continue to take metformin and glibenclamide immediately after birth, but should avoid other oral blood glucose-lowering agents while breastfeeding (NICE, 2015).

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Obstetric management

Antenatal

While similar to that for other higher-risk pregnancies, obstetric management for the diabetic pregnancy (i.e. increased fetal ultrasound monitoring including second-trimester anomaly scan, third-trimester scans for fetal well-being and growth, and frequent antenatal clinic visits) differs in some respects. Particular attention is paid to blood pressure and urinalysis, given the increased incidence of pre-eclampsia in women with diabetes, and the possibility of a presentation of diabetic ketoacidosis with near-normal blood glucose levels. If antenatal steroids are indicated for fetal lung maturation in pre-term labour (usually prior to 34 weeks), they may be given, but hospital admission is necessary for strict glycaemic control with intravenous insulin, using a locally agreed protocol. Additionally, all women for whom an elective caesarean section is planned prior to 38–40 weeks should be given antenatal corticosteroids (Royal College of Obstetrics and Gynaecologists, 2010).

Delivery

Planning of the timing and mode of delivery is important in women with diabetes. The approach to delivery should be individualised, with the medical team considering factors such as estimated fetal weight, glycaemic control and medical and obstetric history to determine the optimal mode and timing of delivery. Advice from an anaesthetist is advisable if significant medical complications are apparent. Tocolytic agents may cause hyperglycaemia (Neilson et al, 2014) and should only be given after consultant-level discussion between the obstetric and diabetes team involved in the woman's care. Caesarean section rates remain high, occurring in 66% of women with type 1 and 56% with type 2 diabetes (with almost half of these being emergency sections; NHS Digital, 2015).

Postpartum care

Women with previous GDM have a significantly increased lifetime risk of developing diabetes, with a relative risk of 7.43 when compared with women with no history of GDM (Bellamy et al, 2009). Significant risk factors for the development of type 2 diabetes after GDM include high glucose levels during pregnancy, family history of diabetes, higher BMI and insulin use in pregnancy. Our practice, in line with International Diabetes Federation (2009) recommendations, is to assess for persistent glucose intolerance 6–12 weeks postpartum with a standard 75-g OGTT, using the standard criteria for diagnosis of diabetes in the non-pregnant population, in line with ADA (2014) criteria.

Current NICE (2015) guidance differs, recommending an FPG only at 6–13 weeks postpartum, or an HbA_{1c} if this window is missed. NICE (2015) does not recommend offering a 75-g 2-hour OGTT. Subsequent health checks for the child in primary care provide additional opportunities to target the mother for HbA_{1c} screening. In addition to early postpartum screening, these women should be offered an annual HbA_{1c} test (NICE, 2015) as they are a high-risk group.

If further pregnancy is planned, women should be counselled that the risk of GDM recurring is up to 41% (Getahun et al, 2010), and that PCC is desirable. Also, breastfeeding appears to confer some protection against progression to type 2 diabetes, at least in the short term (O'Reilly et al, 2011), and should be encouraged.

Conclusion

The management of a pregnancy complicated by diabetes is an intensive process, involving frequent direct patient contact with multiple disciplines, a strict regimen of dietary and exercise measures and frequent blood glucose monitoring. Women with diabetes during pregnancy also require more hospital visits, which have wider lifestyle implications that can add further complications and stress to a pregnancy. A practical approach should include maintaining regular telephone contact outside of hospital visits, which may go some way towards alleviating stress.

It is inevitable that primary care practitioners will see an increasing number of pregnant

Page points

1. Planning of the timing and mode of delivery is important in women with diabetes and should follow the principles of individualised care.
2. Women with gestational diabetes (GDM) have a significantly increased lifetime risk of diabetes.
3. If further pregnancy is planned, women should be counselled that the risk of GDM recurring is up to 41% and that preconception care is desirable.

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"Knowledge of the specific problems faced in the pregnancy complicated by diabetes is essential."

women with diabetes (mainly with GDM or pre-exisiting type 2 diabetes), and will play a significant role in coordinating their overall care. Primary care practitioners are also ideally placed to help increase the proportion of women with diabetes availing themselves of PCC. Knowledge of the specific issues faced in pregnancy complicated by diabetes is therefore essential. ■

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Online CPD activity

Visit www.diabetesonthenet.com/cpd to record your answers and gain a certificate of participation

Participants should read the preceding article before answering the multiple choice questions below. There is ONE correct answer to each question. After submitting your answers online, you will be immediately notified of your score. A pass mark of 70% is required to obtain a certificate of successful participation; however, it is possible to take the test a maximum of three times. A short explanation of the correct answer is provided. Before accessing your certificate, you will be given the opportunity to evaluate the activity and reflect on the module, stating how you will use what you have learnt in practice. The CPD centre keeps a record of your CPD activities and provides the option to add items to an action plan, which will help you to collate evidence for your annual appraisal.

1. What **APPROXIMATE** percentage of pregnancies in England and Wales are complicated by pre-existing or gestational diabetes mellitus (GDM)? Select **ONE** option only.

   A. <1
   B. 5
   C. 10
   D. 15
   E. 20

2. The use of which diagnostic criteria would result in the **HIGHEST** prevalence of GDM? Select **ONE** option only.

   A. IADPSG (2010)
   B. NICE (2005)
   C. NICE (2015)
   D. SIGN (2013)
   E. WHO (1999)

3. What is the **THRESHOLD** maternal age **ABOVE** which there is a **HIGHER** risk of GDM? Select ONE option only.

   A. 25 years
   B. 30 years
   C. 35 years
   D. 40 years
   E. 45 years

4. According to NICE (2015), which is the **MOST** appropriate test for the diagnosis of diabetes in pregnancy? Select **ONE** option only.

   A. Capillary blood glucose
   B. Fasting plasma glucose
   C. HbA_{1c}
   D. 75-g oral glucose tolerance test
   E. Random plasma glucose

5. What is the **APPROXIMATE** level of insulin sensitivity at the end of a **NORMAL** pregnancy in a non-obese woman **WITHOUT** diabetes, compared to her preconception levels? Select **ONE** option only.

   A. 20% (i.e. one fifth)
   B. 40%
   C. 60%
   D. 80%
   E. 100% (i.e. unchanged)

6. According to NICE (2015), what are the **TARGET** capillary glucose levels (mmol/L) for women with GDM? Select **ONE** option only.

	Fasting	1-hour post-prandial glucose
A.	<4.3	<7
B.	<4.6	<7
C.	<5	<7
D.	<5.3	<7.8
E.	<5.6	<7.8

7. A 40-year-old woman with type 2 diabetes has recently been diagnosed with hypertension. She plans to have children in the future. Which is the **SINGLE MOST** appropriate antihypertensive prior to conception? Select **ONE** option only.

   A. Atenolol
   B. Bendroflumethiazide
   C. Losartan
   D. Methyldopa
   E. Ramipril

8. A 27-year-old woman has type 1 diabetes. She currently has a copper intrauterine device (Cu-IUD) for contraception, but wishes to now conceive. Her HbA_{1c} is 96 mmol/mol (10.9%). Which is the **SINGLE MOST** appropriate contraceptive advice? Select **ONE** option only.

   A. Remove the Cu-IUD now
   B. Remove the Cu-IUD when her HbA_{1c} is <48 mmol/mol (6.5%)
   C. Remove the Cu-IUD when her HbA_{1c} is <86 mmol/mol (10%)
   D. Switch to the combined contraceptive pill
   E. Switch to the progestogen only pill

9. A 33-year-old woman has type 1 diabetes. She feels well and is breastfeeding after a normal vaginal delivery yesterday. She does not want to increase her usual carbohydrate intake. Which is the **MOST** appropriate recommendation with regard to the amount of daily insulin she now requires compared to her preconception regimen? Select **ONE** option only.

   A. 50% increase
   B. 25% increase
   C. Same amount
   D. 25% reduction
   E. 50% reduction

10. A 39-year-old woman with GDM is 28 weeks' pregnant and has poor glycaemic control. She is intolerant of metformin and declines insulin. Which is the **SINGLE MOST** appropriate oral antidiabetic agent for specialist initiation? Select **ONE** option only.

    A. Acarbose
    B. Dapagliflozin
    C. Glibenclamide
    D. Pioglitazone
    E. Repaglinide
    F. Sitagliptin