# Insulin management: Treatment choices and pregnancy

The initiation and management of insulin therapy for diabetes is complex, requiring the consideration of many social, clinical and psychological factors. This case scenario, the third in a three-part mini-series, highlights the importance for a woman living with type 1 diabetes to prepare for pregnancy, to receive the right support to self-manage and to achieve glycaemic control during pregnancy.

# **Case presentation**

KW is a 26-year-old woman of White ethnicity. She was diagnosed with type 1 diabetes 14 years ago and is under secondary care, although she has missed several appointments. She has no osmotic symptoms, but has an unplanned pregnancy (her sixth).

Weight: 70 kg

**BMI:** 24.2 kg/m<sup>2</sup>

HbA<sub>1c</sub>: 65 mmol/mol

BP: 118/77 mmHg

Lipid profile: TC 2.4; TG 0.5; HDL 1.2; LDL 0.9; non-HDL 1.2 mM/L

**eGFR:** >90 mL/min/1.73 m<sup>2</sup>

ACR: Below limit of detection

Past medical history: Gravida 6, para 3

**Medications:** Toujeo (insulin glargine) 85 units in the morning; NovoRapid (insulin aspart) 8 units with meals (has regular meals). Has FreeStyle Libre 2 Family history: Unknown, adopted

**Social history:** Lives with her 3 children (8, 6 and 2 years old); trying to stop smoking

KW attended the GP surgery with her sixth unplanned pregnancy at 6 weeks. She was aware of the antenatal diabetes clinic from her previous pregnancies, but chose not to engage with the clinic owing to difficulties with childcare.

She had previously been advised that blood glucose levels persistently much higher than recommended pre-conception and during pregnancy increase the risk of pre-eclampsia, congenital malformations, miscarriage, stillbirth and preterm labour (NICE, 2020). Furthermore, type 1 diabetes is associated with a 2–5-fold increased risk of congenital anomaly, stillbirth or neonatal death. Intensive blood glucose control, therefore, reduces the risk of adverse outcomes in mother and baby (Egan et al, 2020).



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# **Pre-conception advice**

For women who are planning to become pregnant, NICE recommends the use of contraception until recommended glucose levels are reached and, as such, suggests that monthly  $HbA_{1c}$  readings may be useful (NICE, 2020). It is advised that, at every contact with a woman of childbearing age who is living with diabetes, there should be a discussion about pre-conception blood glucose control together with contraception (American Diabetes Association, 2020; Egan et al, 2020). It

is also important to highlight the need for more frequent contact with healthcare professionals during pregnancy to review blood glucose targets, monitoring, lifestyle advice and medication (Healy, 2022).

KW had experienced three normal births previously. Diabetes may increase the risk of having a baby who is large for gestational age, which, in turn, may increase the risk of birth trauma and induction of labour, as well as instrumental and caesarean section delivery (NICE, 2020).

# Self-management, education and support

At her first consultation, KW was advised to take folic acid (5 mg/day) until 12 weeks of pregnancy to reduce the risk of neural tube defects, and was referred to the joint antenatal and diabetes clinic and for an early pregnancy scan (NICE, 2020).

Diabetes distress may accompany a change in medical status, when complications occur or if treatment intensification is required, as may be the case with an unplanned pregnancy (ElSayed et al, 2023). It may be associated with glucose levels persistently much higher than recommended (Fisher et al, 2012; ElSayed et al, 2023).

KW was anxious about the effect of her high glucose levels on her baby and was willing to engage in her diabetes review because of this. When it was explored why she had missed several of her diabetes reviews, it seemed to be related to the demands of having a young family and variable social support.

There was no history of hypoglycaemia, and blood glucose monitoring showed levels 7–14 mmol/L. Urine albumin–creatinine ratio (uACR) and blood tests were requested at the time of presentation. KW was advised about the need for more frequent monitoring, to include blood glucose monitoring pre-meals, one hour after meals and at bedtime (NICE, 2020; Jaffar et al, 2022). This was achieved through continuous glucose monitoring (CGM). It was noted that she had retinal screening recently and, as per NICE guidance, she was advised that this would be repeated during pregnancy, as pregnancy may worsen pre-existing microvascular disease in diabetes.

## Achieving glycaemic control

According to NICE (2020), pregnant women living with diabetes should be advised to have a fasting blood glucose level of <5.3 mmol/L, <7.8 mmol/L 1 hour after meals or <6.4 mmol/L 2 hours after meals, if these are achievable without causing hypoglycaemia. For pregnant women with diabetes taking insulin, blood glucose levels should be maintained >4 mmol/L. NICE also states that in the context of pre-existing diabetes, if HbA<sub>1c</sub> is >48 mmol/mol there is an increased level of risk to mother and baby. The American Diabetes Association (ADA) advises that the HbA<sub>1c</sub> target in pregnancy should be <42 mmol/mol, again while being cognisant of the risk of hypoglycaemia (ADA, 2020). The ADA recommends that this target may be relaxed to <53 mmol/mol, dependent on an individual's risk of maternal hypoglycaemia. Note that  $HbA_{1c}$  is slightly lower during normal pregnancy, owing to the increased rate of red blood cell turnover.

As KW has insulin-treated diabetes, she was advised of the risks of hypoglycaemia and the potential for reduced awareness of this in pregnancy. The latter may be particularly apparent in the first trimester. Prior to her pregnancy, KW was using the FreeStyle Libre 2 for intermittently scanned continuous glucose monitoring (isCGM) and wished to continue using it. NICE (2022) recommends the use of real-time CGM in this situation, unless there is a preference for isCGM. She was also given blood ketone testing strips, in case of illness and/or hyperglycaemia. Pregnant women living with type 1 diabetes are at greater risk for diabetic ketoacidosis, which carries an increased risk of stillbirth (ADA, 2020).

At presentation, her  $HbA_{1c}$  was 65 mmol/mol, and KW was reassured that any reduction in this would confer a risk reduction to the baby (NICE, 2020). Continuous glucose monitoring can be helpful in achieving stricter glycaemic control during pregnancy (Feig et al, 2017; Schaefer-Graf et al, 2018).

To reduce the risk of hyperglycaemia or hypoglycaemia, it is important that pregnant women have a consistent intake of carbohydrate to match their insulin dosing (ADA, 2020). KW was referred to a dietitian to support this and concerns about weight gain related to insulin therapy that had occurred in previous pregnancies.

At her initial consultation in secondary care 8 weeks into her pregnancy, her Toujeo (insulin glargine) was increased from 85 to 100 units once a day and NovoRapid (insulin aspart) from 8 to 20–24 units before meals. It is significant that glucose levels are lower in early pregnancy, owing to an increase in insulin sensitivity. This means that most pregnant women living with type 1 diabetes will have a lower insulin requirement. However, this may need to be balanced with overall glycaemic control. By around 16 weeks of pregnancy, the situation rapidly reverses, and insulin resistance increases exponentially during the second trimester and early third trimester. Insulin requirements



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diminish towards the end of the third trimester as the placenta ages (ADA, 2020; Healy, 2022).

Hybrid closed-loop (HCL) systems link CGM with insulin pump technology to monitor blood glucose levels and automatically adjust the amount of insulin given through a pump. This is recommended for the management of type 1 diabetes in pregnancy (NICE, 2023). Given the improvement of maternal glucose control using these systems, maternal and neonatal outcomes may be improved. This was offered to KW but, following discussion, she preferred isCGM as this method of monitoring was familiar to her.

A fetal growth scan at 34 weeks (28 weeks after presentation) revealed that the baby had an abdominal circumference exceeding the 95<sup>th</sup> percentile. Maternal hyperglycaemia in the second and third trimesters may cause macrosomia, but pregnant women living with diabetes with microvascular disease may have an increased risk of intrauterine growth restriction (Egan et al, 2020).

#### **Postpartum support**

It is important to consider insulin requirements following delivery as insulin resistance will significantly decrease postpartum. The ADA recommends breastfeeding for all individuals with diabetes. Moreover, future contraceptive methods should be planned and long-acting reversible contraception (LARCs) may be considered, if clinically appropriate. This is because preconception diabetes care is suboptimal if future pregnancies are unplanned. Psychosocial assessment postpartum includes proactively enquiring about mental health and practical support, as well as offering signposting to relevant services.

#### **Key messages**

This case highlights the need for a multidisciplinary approach to the care of pregnant women with type 1 diabetes and emphasises the need for close monitoring of blood glucose levels, with insulin dose adjustments as pregnancy progresses (McCance and Casey, 2019).

- American Diabetes Association (2020) 14. Management of Diabetes in Pregnancy: Standards of Medical Care in Diabetes–2020. *Diabetes Care* 43(Suppl 1): S183–92
- Egan AM, Dow ML, Vella A (2020) A review of the pathophysiology and management of diabetes in pregnancy. *Mayo Clin Proc* **95**: 2734–46

# Learning points

- Blood glucose levels persistently much higher than recommended pre-conception and during pregnancy increase the risk of pre-eclampsia, congenital malformations, miscarriage, stillbirth and preterm labour.
- Intensive blood glucose control reduces the risk of adverse outcomes in mother and baby.
- It is advised that, at every contact with a woman of childbearing age who is living with diabetes, there should be a discussion of preconception blood glucose control together with contraception.
- HbA<sub>1c</sub> is lower during pregnancy due to the increased rate of red blood cell turnover.
- Maternal hyperglycaemia in the second and third trimesters may cause macrosomia, but pregnant women living with diabetes with microvascular disease may have an increased risk of intrauterine growth restriction.
- Hybrid closed-loop (HCL) systems link continuous glucose monitoring (CGM) with insulin pump technology to monitor blood glucose levels and automatically adjust the amount of insulin given through a pump. This is recommended for the management of type 1 diabetes in pregnancy.

- Feig DS, Asztalos E, Corcoy R et al (2017) CONCEPTT: Continuous Glucose Monitoring in Women with Type 1 Diabetes in Pregnancy Trial: A multi-center, multi-national, randomized controlled trial. *Lancet* **390**: 2347–59
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- Healy AM (2022) Diabetes in pregnancy: preconception to postpartum. Prim Care 49: 287–300
- McCance DR, Casey C (2019) Type 1 diabetes in pregnancy. Endocrinol Metab Clin North Am **48**: 495–509
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### Insulin management: Treatment choices and comorbidities

The second of Suneeta Kochhar's case studies highlights how risks and benefits can be balanced in an elderly, frail individual.

Journal of Diabetes Nursing (2025) **29**: JDN371

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ElSayed NA, Aleppo G, Aroda VR et al; the American Diabetes Association (2023) Facilitating positive health behaviors and well-being to improve health outcomes: Standards of care in diabetes – 2023. *Diabetes Care* **46**(Suppl 1): S68–96