

Overview of the care of pregnant women with pre-existing diabetes

Joy Williams

ARTICLE POINTS

1 The outcome for diabetic pregnancy remains poor despite improvements in care.

2 Women should be advised about good preconceptual care to improve pregnancy outcome.

3 Good glycaemic control at conception and during organogenesis reduces the risk of fetal abnormalities.

4 Warning signs for hypoglycaemia may change or disappear in pregnancy.

5 Smoking is related to poor pregnancy outcome.

KEY WORDS

- Diabetes
- Pregnancy
- Hypoglycaemia
- Preconceptual care
- Fetal abnormalities

Joy Williams is a Senior Diabetes Specialist Nurse at Worthing & Southlands NHS Trust.

Introduction

Diabetes is the most common pre-existing medical condition complicating pregnancy in the UK. One in 250 pregnant women are estimated to have pre-existing diabetes. They are more likely than non-diabetic women to lose their baby, either during pregnancy by miscarriage or intrauterine death, or after the birth. The DSN has an important role in educating, advising and supporting these women during pregnancy. This article gives an overview of the information and tests that women with type 1 and 2 diabetes require before and during pregnancy. Joint diabetes antenatal clinics attended by a diabetologist, obstetrician and DSN or midwife are effective in providing specialist care to this high-risk group of women, thereby optimising pregnancy outcome.

Before the discovery and availability of insulin in 1923, women with type 1 diabetes usually died within a year of diagnosis, pregnancy was rare and morbidity and mortality for both mother and child were high (Khan, 1988). Since then great advances have been made in diabetic management and antenatal and neonatal care to improve maternal and fetal outcomes.

Type 2 diabetes was uncommon in women of childbearing years, but has become more prevalent recently. In Western societies, expectations are high that pregnancy and birth will proceed normally; for the majority the outcome is good, but for women with diabetes there is no room for complacency. The Northern Diabetic Pregnancy Audit (1997) showed that most women who planned their pregnancies and received preconceptual care had poor diabetic control at the time of conception.

Among women with pre-existing diabetes the perinatal mortality rate is five times higher, the neonatal mortality rate is 15 times higher and the congenital malformation rate is four times higher than in the general population. There is a substantial excess of premature births in women with diabetes, and overall the outcome of diabetic pregnancy remains poor, but better uptake of preconceptual care may improve the outcome (Hawthorne et al, 1997).

Influencing factors

In 1989, the St Vincent's Declaration set a 5-year target to reduce the adverse pregnancy outcome for women with diabetes to a level equal to that of the non-diabetic population. The St Vincent Task Force recommended that women with diabetes should be advised to seek pre-pregnancy counselling and have effective pre-pregnancy care of planned pregnancies to reduce the risk of congenital malformations – the major cause of perinatal morbidity and mortality associated with diabetic pregnancy.

Women achieving good glycaemic control have a perinatal mortality rate similar to that of women without diabetes; however, the risks of morbidity to both mother and fetus remain higher among pregnant women with diabetes than in the general population.

There is currently no national standard of care for pregnant women with diabetes. The National Service Framework (NSF) for Diabetes Standard 9 recommends:

'The NHS will develop, implement and monitor policies that seek to empower and support women with pre-existing diabetes and those who develop diabetes during pregnancy to optimise the outcomes of their pregnancy'

However, the NSF implementation strategy is still awaited. The Confidential Enquiry into Stillbirths and Deaths in Infancy Secretariat

(CESDI) is currently undertaking a national study into the outcomes of diabetes in pregnancy and is including all women who have had type 1 or type 2 diabetes for more than one year. Changing Childbirth (Expert Maternity Group, 1993) recognises that maternity care should be woman centred and tailored to the needs of the individual. In the interim, this article aims to inform the DSN of the tests and information required by these women.

Preconceptual care

The couple planning pregnancy must understand the demands involved: intensive monitoring of the woman's blood glucose levels and regular hospital attendances. As clinicians we need to be supportive of women with diabetes who are planning pregnancy, because the effort to achieve good blood sugar control before conception and during pregnancy places great psychological strain on them. The woman will often blame herself for failing to control her diabetes adequately if problems arise during the pregnancy.

Preconceptual care is advised for these women to encourage optimal blood glucose control and health for pregnancy. Folic acid (400 µg daily) is recommended to reduce the risk of neural tube defects such as spina bifida. Renal function should be assessed by the diabetologist before pregnancy; if renal function is severely compromised, then fetal prognosis is poor and maternal morbidity is increased. With good blood sugar and blood pressure control, fetal outcome in diabetic women with nephropathy can be good, and the deterioration in renal function can be delayed (Kitzmiller et al, 1996). Unfortunately, pregnancy-induced hypertension may ensue, and could further compromise the condition (Kitzmiller et al, 1996). The key components of preconceptual care are listed in Table I.

Blood sugar control

Women with diabetes have an increased risk of congenital fetal abnormalities compared with women without diabetes and need to achieve tight blood sugar control from conception through organogenesis to reduce this risk. A mother is at risk of developing pregnancy complications

of pre-eclampsia, preterm labour, infection, and birth trauma due to a large baby, especially if her blood sugar levels are poorly controlled.

Keeping such a tight control of blood sugar levels inevitably leads to episodes of hypoglycaemia. Maternal hypoglycaemia, although distressing and potentially dangerous to the mother, has also been implicated in long-term cognitive deficits in the infant and may also be a cause of fetal intrauterine growth restriction (Rosenn and Miodovnik, 2000). To complicate matters further, a woman may experience a change or disappearance of her hypoglycaemia awareness during pregnancy and should be warned of this.

Medication

Early referral to the specialist care team is essential. Women should be taking 400 µg folic acid once daily. Cholesterol-lowering medication should be discontinued before pregnancy. Hypertension should be controlled using non-teratogenic medication such as methyldopa (Williams and Pickup, 2002).

Insulin treatment

Women of childbearing years with type 1 diabetes are frequently on multiple injection therapy as a response to the findings of the Diabetes Control and Complications Trial (1993). It has been shown that giving insulin four times a day in pregnancy improves glycaemic control and perinatal outcome (Nachum et al,

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1 The CESDI are currently undertaking a national study into the outcomes of diabetes in pregnancy.

2 Preconceptual care is advised for women with diabetes who are planning pregnancy, to improve pregnancy outcome.

3 Women with diabetes have an increased risk of congenital fetal abnormalities.

4 Oral hypoglycaemic agents are not recommended in pregnancy because of the possible teratogenic effect on the fetus.

Table I. Preconceptual care

- Quit smoking
- Medical assessment
- Retinal assessment
- Folic acid
- $\text{HbA}_{1c} > 7 \text{ mmol/litre}$
- Review medication

PAGE POINTS

1 During pregnancy, a woman with diabetes may require up to three or four times her pre-pregnancy dose of insulin.

2 Women whose insulin requirements fall towards the end of pregnancy should be referred immediately to the delivery suite as this may be a sign of placental insufficiency.

3 Women should be encouraged to remain active, unless contraindicated; however, exercise that overheats the mother cannot be recommended, as the fetus has no cooling mechanism.

4 Preconceptual care should include screening by the ophthalmologist for diabetic retinopathy, which may deteriorate during pregnancy.

1999). In addition, the flexibility of a basal bolus regimen is useful during pregnancy to enable doses to be adjusted easily.

Women with type 2 diabetes who do not have good glycaemic control on diet alone should be transferred to insulin treatment for pregnancy.

Oral hypoglycaemic agents are not recommended in pregnancy because of the possible teratogenic effect on the fetus (Kelleher, 1994). Others have disputed this (Hellmuth et al, 1994; Chahal and Hawkins, 1989), but oral hypoglycaemic agents are not generally used in pregnancy because better diabetic control can be achieved with insulin if diet alone is insufficient. In addition, the neonate can suffer marked hypoglycaemia if oral hypoglycaemic agents are used (Chahal and Hawkins, 1989).

Insulin glargine is not recommended for pregnant women, as there is a theoretical risk of it being teratogenic because of its insulin-like growth factor binding.

During the early weeks of pregnancy some women suffer hypoglycaemic episodes if their insulin requirements fall, perhaps due to increased insulin sensitivity, or because they are eating less to avoid nausea. The insulin requirements rise from about 14–16 weeks' gestation until about 34 weeks' gestation. During pregnancy, a woman with diabetes may require up to three or four times her pre-pregnancy dose of insulin. Women whose insulin requirements fall towards the end of pregnancy should be referred immediately to the delivery suite as this may indicate placental insufficiency.

Aims of blood glucose control

It is recommended that blood glucose control at the time of conception and throughout organogenesis be maintained at non-diabetic levels to reduce the risk of fetal abnormalities (Casson et al, 1997; Kitzmiller et al, 1991).

In the second half of pregnancy, poor blood sugar control is associated with an accelerated and abnormal growth pattern (Williams and Pickup, 2002). Women are advised to maintain blood sugar levels between 4 and 6 mmol/L before meals and between 4 and 8 mmol/L for 2 h after meals. Glycated haemoglobin ($\text{HbA}_{1\text{c}}$) of 7% or below is recommended before pregnancy.

Smoking

Smoking is a major avoidable cause of ill health implicated in the progression of diabetic vascular disease. It is related to poor pregnancy outcome but has not been implicated in congenital abnormalities (Steel et al, 1990). Smoking must be discouraged in pregnant women with diabetes.

Hyperemesis gravidarum (morning sickness)

Nausea and vomiting are common during early pregnancy; an early morning snack before rising and regular meals can frequently help to relieve this problem. More severe vomiting often requires the woman to be admitted to hospital for rehydration, especially if ketones are present. Sick day rules apply: never stop the insulin, frequent blood sugar monitoring and carbohydrate intake in the form of sugary drinks and a light diet.

Rapid-acting insulin analogues are useful because they can be taken after the meal when the woman knows how much she has been able to eat or retain, with the opportunity of adjusting the dose.

Retinal eye screening

Preconceptual care should include screening by the ophthalmologist for diabetic retinopathy, which may deteriorate during pregnancy: women should be screened once in each trimester of pregnancy. Laser photocoagulation treatment can be undertaken in pregnancy if necessary.

Diet and exercise

In addition to the healthy diet recommended for everybody, pregnant women should be advised to avoid the risk of infections that are teratogenic to the fetus. Meat and eggs should be well cooked; cheese and milk should be pasteurised; fruit and vegetables should be well washed; and liver should be avoided.

Careful hand washing is essential after contact with pets or gardening.

Exercise, while a vital part of diabetes care, should be limited during pregnancy. Women should be encouraged to remain active, unless contraindicated; however, exercise that overheats the mother cannot be recommended, as the fetus has no

mechanism for cooling off. Swimming and walking are normally suitable.

Screening for fetal abnormalities

Antenatal screening is offered to all women in the UK although the tests available vary. The Bart's or triple test assesses the risk of having a baby with Down's syndrome and neural tube defects from a maternal blood sample taken at about 16 weeks' gestation. However, in women with type 1 diabetes all the serum markers are reduced, making the results more difficult to interpret.

In areas where it is available, nuchal screening can be recommended instead. This screening test uses ultrasound scanning to measure the thickness of the nuchal fold at the back of the fetal neck, which is only measurable between 11 and 14 weeks' gestation. An increased nuchal thickness could indicate a chromosome or cardiac defect. Women receiving positive screening test results are offered an invasive diagnostic test. There is a 1–2% risk of miscarriage with invasive testing.

Ultrasound scans

A dating scan at about 12 weeks' gestation confirms viability and gestation and is necessary before a Bart's screening test to reduce the variables. The dating scan is included in the nuchal screening assessment.

A detailed anomaly scan is undertaken at about 20 weeks' gestation. Women with diabetes should be offered a detailed cardiac scan to exclude major cardiac anomalies. These are available in regional centres at about 24 weeks' gestation.

From 28 weeks gestation, women are offered serial scans to measure growth and liquor volume, routinely at 4-weekly intervals. It has been found that the serial growth for bony measurements in women with diabetes follows the mean for their gestational age. However, the abdominal circumference follows two patterns: either it conforms to the mean, which may be growth restricted and more susceptible to distress in labour, or there may be accelerated growth with substantially more subcutaneous fat, making delivery more traumatic.

The liquor volume is also measured at all scans: polyhydramnios, an increased liquor volume, is associated with poor blood sugar

control; oligohydramnios, a reduced liquor volume, is associated with fetal growth restriction. Doppler examination, measuring the blood flow between the placenta and the fetus, is used when the fetus is growth restricted.

Fetal movements

Fetal movements are a good indicator of baby wellbeing in the last trimester of pregnancy. Any woman reporting a reduction in movements should be referred for fetal monitoring.

Delivery

If the woman is expected to deliver prematurely, she should be given intramuscular steroid injections to mature the fetal lungs, and her insulin doses should be adjusted to treat the rise in blood sugar levels.

Spontaneous delivery at term is the ideal, but attained by few as many women go overdue! The obstetric diabetes team should plan delivery. Caesarean section rate is higher in pregnancy complicated by diabetes. Women are usually delivered between 38 and 40 weeks' gestation if there is no indication to deliver earlier.

During labour or caesarean section, blood sugars should be controlled by a continuous infusion of insulin and glucose commenced and continued until the woman is able to eat without risk of vomiting. Once she has delivered the placenta her insulin requirements will quickly return to pre-pregnancy levels so the insulin rate should immediately be halved. At the first mealtime she should give her pre-pregnancy dose of insulin and one hour later she should stop the sliding scale. She then should then monitor her blood sugar levels regularly. She may need to reduce her insulin dose if she is breast-feeding.

Neonatal problems

Poor glycaemic control can lead to delayed lung maturity in the baby and subsequent breathing difficulties. It is therefore preferable for birth to be delayed until as close to term as possible.

Conclusion

While pregnancy complicated by diabetes can be problematic and demanding, the DSN has an important role to play in

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the multidisciplinary team, supporting and caring for the couple during pregnancy by ensuring that care is tailored to the woman's needs. Discussing family planning at all routine diabetic clinic visits with women of childbearing years, and stressing the importance of good preconceptual care, should be an integral part of each visit, to improve pregnancy outcomes. ■

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