Gestational diabetes

practice points for GPs

A 30-year old with a family history of diabetes, hypertension and cardiovascular disease has an abnormal result on a glucose challenge test in her first pregnancy. What are your next steps?

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A predisposition to hyperglycaemia may be increased by the changes of a pregnancy, precipitating clinical hyperglycaemia (gestational diabetes). Postpartum, the predisposition decreases to the previously lower level although gestational diabetes is likely to develop in future pregnancies. In the long term, time and lifestyle effects increase the predisposition again and clinical diabetes type 2 is likely to develop.

The debate

There is no doubt that severe maternal hyperglycaemia has adverse effects on the fetus and may be associated with death *in utero*,

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Table 1. Fetal effects of maternal hyperglycaemia[1]

- Neonatal hypoglycaemia
- Shoulder dystocia
- Neonatal cardiac dysfunction
- Neonatal kernicterus
- Death *in utero*
- Infantile respiratory distress
- Neonatal hypocalcaemia

difficulties in delivery and perinatal morbidity and mortality (Table 1 and Figure 1).[1] There may also be long term effects for the child, including obesity, lesser cognitive ability and increased predisposition to type 2 diabetes.

There is clear consensus that would-be mothers with diabetes should strive for ideal glycaemic control before conception and during pregnancy and that the professional team should actively support the mother and monitor the pregnancy. However, there is less agreement about lesser degrees of hyperglycaemia – that is, those below the diabetes diagnostic levels of fasting plasma glucose ≥7.0 mmol/L and 75 g oral glucose tolerance test (OGTT) 2-hour glucose >11.1 mmol/L).[2]

The conservative view might be that in the absence of evidence of benefit for intervention the guiding rule should be 'first do no harm'. Reasons for and against screening for gestational diabetes are listed in Table 2.[3] Diagnosis of gestational diabetes will cause the mother to feel guilt as well as concern that her baby is at risk, and treating it requires the mother to modify her lifestyle, monitor her blood glucose and attend extra professional consultations. The perceived dangers associated with the condition may lead to the professional team intervening unnecessarily and putting the mother, her baby or both at risk.

The activist might accept these disadvantages but would stress that glycaemic control and more active monitoring reduces the risk of obstetric mishap and should improve short and long term outcomes for the baby. Moreover, diagnosis of gestational diabetes makes the mother aware that she is at high risk of developing type 2 diabetes later in life (Table 3).[4] She then has the opportunity of making appropriate lifestyle changes and establishing future monitoring schedules.

Figure 1. A macrosomic gestational diabetes baby at term.

Recommendations

At present the Australasian Diabetes in Pregnancy Society (ADIPS) leans towards the activist view and recommends:[3]

- screening of pregnancies between 26 and 28 weeks (see the flowchart on page 47)
- active management of glycaemia during pregnancy and delivery – blood glucose targets are fasting <5.5 mmol/L and 2-hour postprandial <7.0 mmol/L
- more active obstetric monitoring – especially if glycaemia is not controlled or there is a second complication, such as hypertension.

The clinical issues

Case study

Mary is 30 years old and is having her first pregnancy. You are sharing her obstetric care with the

IN SUMMARY

- **All pregnant women should be checked for gestational diabetes at about 26 to 28 weeks.**
- **High risk women should be checked before conception and at 12, 26 to 28 and 32 weeks' gestation.**
- **A shared-care multidisciplinary approach is the key to successful management.**
- **Lifestyle modification and insulin therapy may be needed.**
- **Target blood glucose values during the pregnancy are below 5.5 mmol/L before meals and below 7.0 mmol/L two hours after meals.**
- **Extra obstetric monitoring may be required.**
- **Advise on the risk of diabetes to the child, with future pregnancies and in the long term.**
- **Consider assessing other cardiovascular risk factors.**

Table 2. Gestational diabetes: to screen or not to screen

For screening

Evidence of macrosomia associated with maternal hyperglycaemia

Gestational hyperglycaemia predictive of future maternal diabetes

Against screening

No international agreement on diagnostic levels

No prospective randomised controlled trial demonstrating benefits from intervention

Unnecessary 'medicalisation' of pregnancy

regional obstetric team. Mary is slightly overweight, based on her body mass index (BMI) of 26.2 kg/m^2 calculated using her pre-pregnancy weight of 67 kg and her height of 160 cm (the BMI range for overweight is 25 to 30 kg/m^2). She is a nonsmoker and has not drunk alcohol during the pregnancy. She takes no medication apart from folate supplements. Her only past history includes ear grommets as a child and removal of a nasal polyp when she was in her twenties. She has a family history of diabetes (mother diagnosed aged 51 years), hypertension and cardiovascular disease (father had an infarct at the age of 59 years).

Thus far, all has gone well with Mary's pregnancy. She has gained 5 kg, her blood pressure is consistently less than 115/70 mmHg, her urinalysis is normal and so were her earlier screening investigations. She is now 25 weeks' pregnant and is seeing you for the result of her glucose challenge earlier this week.

After the 50 g glucose load her 1-hour plasma glucose value was 8.4 mmol/L.

Table 3. Risk factors for type 2 diabetes

Genetic predisposition:

- first degree relative – mother, father, brother, sister
- Aboriginal or Torres Strait Islander, Polynesian or Asian

Age over 40 years

Overweight

Hypertension

Past history of gestational diabetes or glucose intolerance

Figure 2a (left) and b (right). Performing a blood glucose test.

How do you interpret the result?

The value is abnormal – that is, above the positive gestational diabetes screening test result of 7.8 mmol/L plasma glucose one hour after a 50 g glucose load – and identifies Mary as being at risk for gestational diabetes.[3] The appropriate next step is for Mary to have a diagnostic OGTT after appropriate preparation (see flowchart on page 47).

Further case information

The results of the OGTT were:

- fasting, 6.2 mmol/L
- 2-hour, 9.4 mmol/L.

What are your next steps?

Mary's diabetes team should be able to help her understand what gestational diabetes is, what lifestyle modifications would be advisable and how she could monitor her blood glucose (Figure 2).

Table 4. Mary's blood glucose profile

	Blood glucose (mmol/L)					
	Breakfast		Lunch		Dinner	
	Before	After	Before	After	Before	After
32 weeks						
Monday	4.8		5.5		6.0	7.2
Tuesday	4.5	8.1				
Wednesday			6.4	8.4		
Thursday	5.1					
36 weeks						
Monday	7.2	8.4	5.1	7.0	4.7	
Tuesday	6.9				5.1	
Wednesday	8.1	9.0				
Thursday	7.8		5.4			

Often minor lifestyle modification is enough to bring blood glucose values into the target range and patients usually co-operate with reasonable suggestions.

Mary would probably need to decrease her fat and sugar intake and increase her intake of complex carbohydrate. (This would apply to most Australians because average daily fat, sugar and complex carbohydrate intakes represent 37, 22 and 20%, respectively, of daily energy intake, which is very different from the recommended <30, <10 and >40%). Mary might also be able to increase her activity, which would improve her insulin sensitivity and glycaemic control and help her control weight gain.

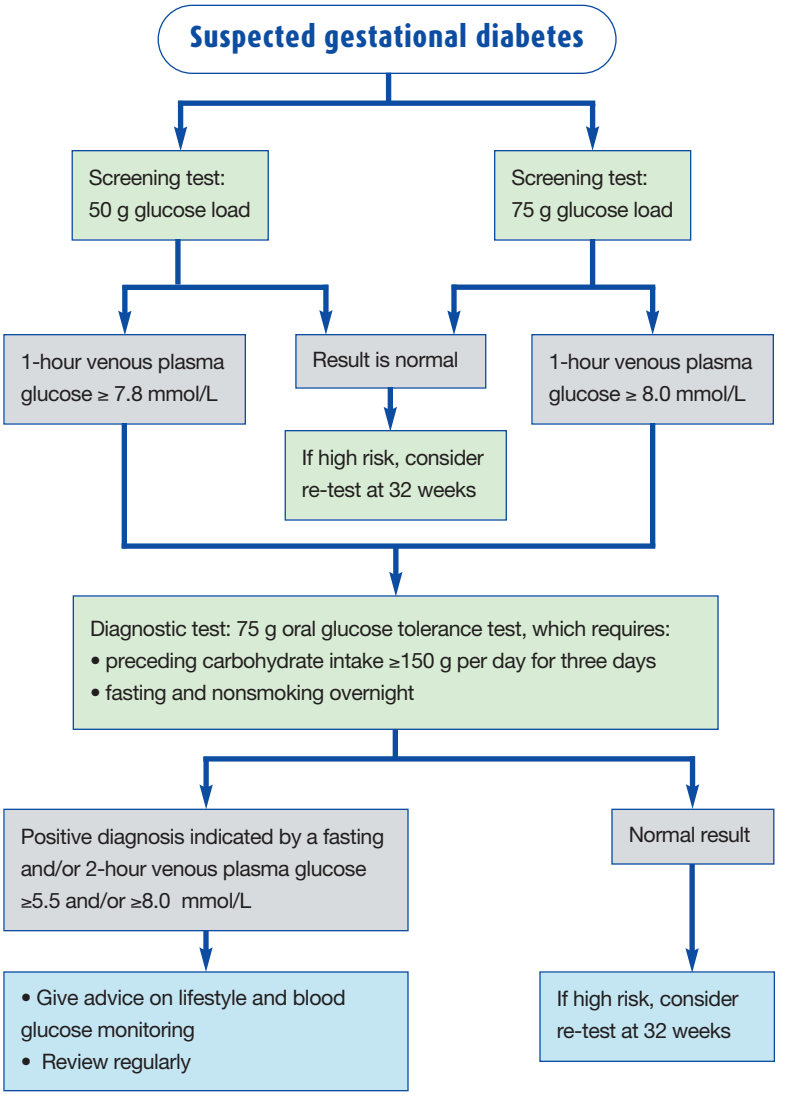
Initially, Mary should measure blood glucose values several times through the day before and after meals (two hours after picking up the knife and fork). Once it is clear that the glycaemia is controlled, the recommended testing frequency can vary with the clinical situation.

Further case information

Mary has responded positively to advice from the diabetes nurse and dietitian and says she is pleased with the changes in her eating and activity schedules. Pre- and postprandial blood glucose values are all within the target range.

At 32 weeks, Mary's blood glucose profile for the past four days is as shown in Table 4. She is upset that the values are higher than before and asks if the baby should be checked, whether she will still be able to deliver the baby vaginally at term and whether the baby will be OK?

Screening for and diagnosis of gestational diabetes (26 to 28 weeks)



How should you advise her?

Insulin therapy is recommended if, over seven to 10 days, two or more plasma glucose values exceed target (that is, preprandial <5.5 mmol/L and 2-hour postprandial <7.0 mmol/L.) Various insulin schedules are recommended, with the general aim of mimicking the normal insulin profile. The advice of a specialist colleague may be useful.

Generally, intermediate insulin – that is, isophane and NPH (Humulin NPH, Protophane) – provides background insulin, and quick acting insulin – that is, neutral – is added before meals if needed to control postprandial hyperglycaemia. Although there is little evidence suggesting problems, most authorities recommend that the quick acting insulins used are the recombinant human insulin preparations (Actrapid, Humulin R) rather than the newer insulin analogues (Humalog, NovoRapid). Both forms of insulin can be used in pen injectors, which make insulin schedules simpler and much more convenient.

If blood glucose values exceed target, the preceding insulin dose is adjusted. For example, if the blood glucose after breakfast is high, the morning quick

acting insulin (neutral; clear) dose can be increased. If values before breakfast are too high, the evening intermediate insulin (isophane, NPH; cloudy) dose can be changed.

If there are no obstetric complications, Mary's pregnancy is still low risk. Assuming glycaemic control is re-established, extra fetal monitoring at this stage is not indicated (as opposed to in a high risk pregnancy with persistent hyperglycaemia, when an ultrasound at 32 weeks is recommended). All else being well, Mary should be able to deliver vaginally at term and can expect an uncomplicated delivery. At many centres the neonate is observed in the nursery, although this is usually for less than 24 hours. Mary would be encouraged to breastfeed.

Further case information

Mary visited an endocrinologist who started her on a basal bolar schedule of bedtime intermediate insulin (15 units isophane, NPH) and neutral insulin 30 minutes before each meal (4 to 8 units neutral). She is now 36 weeks' pregnant and is due to see the endocrinologist later that day. Her blood glucose record for the past few days is shown in Table 4.

What insulin changes should be recommended?

Mary's main problem is fasting hyperglycaemia and her night dose of intermediate insulin should be increased by 10 to 20%. She should be advised of the risk of night-time hypoglycaemia as fetal glucose demands in the last trimester increase considerably (she should ensure that she takes a bedtime snack of complex carbohydrate), and should consider checking blood glucose levels half way through the night to make sure they are not too low.

If her blood glucose values after breakfast are still high despite her fasting values being in the target range, the before breakfast dose of quick acting insulin should be increased.

Further case information

All does go well and Mary's son, Timothy, was born at 38 weeks after a slightly long second stage (4.5 hours) but with no problems for mother or son. Timothy's birthweight was 3.2 kg. He paid a brief visit to the neonatal nursery, but was reunited with Mary after three hours. Mary found it difficult to completely breastfeed Timothy and is increasingly using bottle feeds.

She sees you three weeks after the birth to ask you about Timothy's future risk of diabetes and her risk of diabetes in future pregnancies and in the longer term. She's heard that Timothy is likely to develop diabetes, especially since she is not breastfeeding exclusively.

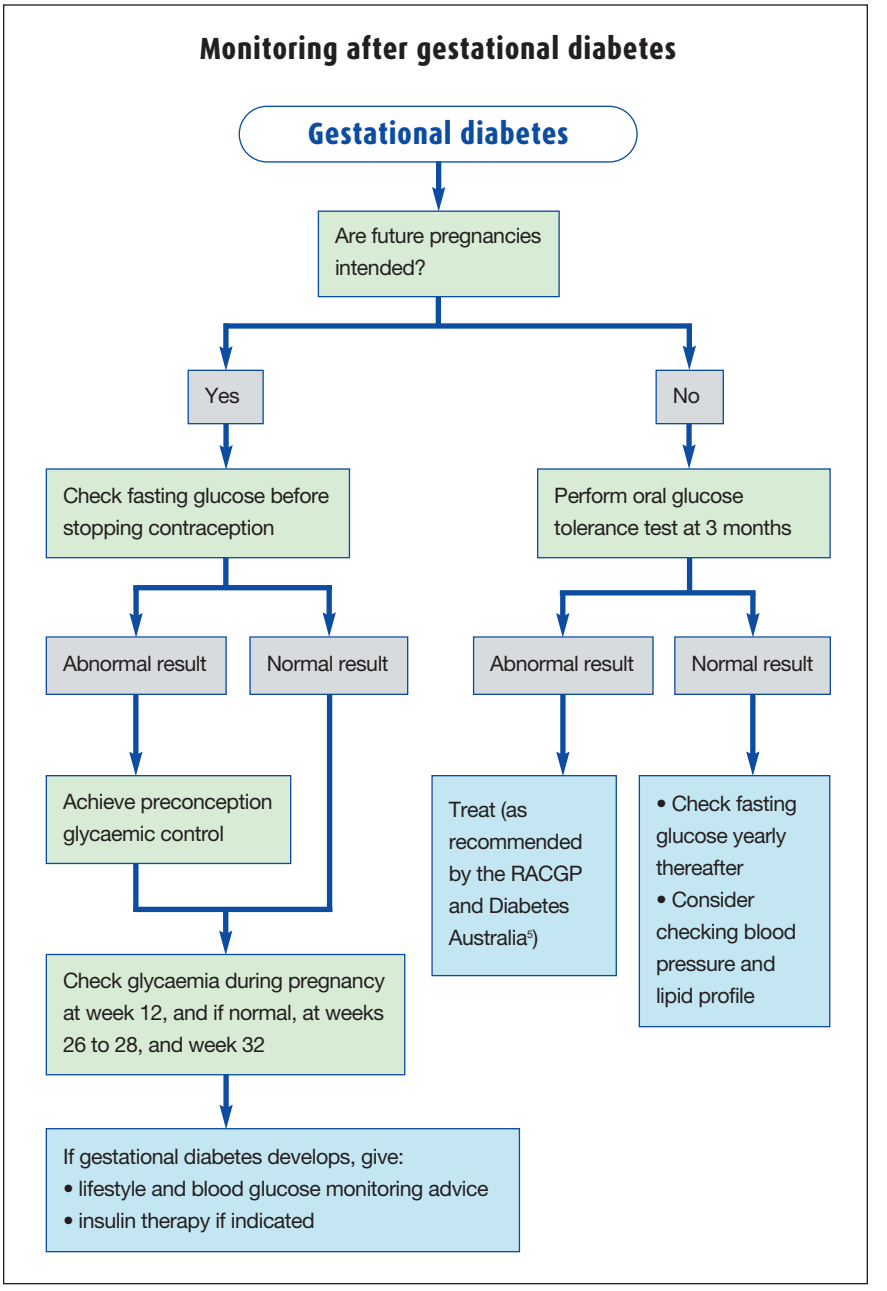


Table 5. The metabolic syndrome (syndrome X)

The 'hypers':
- glycaemia
- tension
- lipidaemia
- insulinaemia

Central obesity – waist circumference
men >90 cm; women >100 cm

Cardiovascular risk

How should you advise her?

Timothy has a higher than average risk of developing type 2 diabetes in future (adult) life. Assuming Mary develops diabetes, his lifetime risk would be approximately one in three as opposed to about one in 10 in the general population.[5] He is at no increased risk of developing type 1 diabetes since the two forms of diabetes are inherited independently. Breastfeeding does seem to reduce the risk of developing type 1 diabetes for children of parent(s) with type 1 diabetes but does not affect the future risk of developing type 2 diabetes.

Mary can be assessed for the future development of glucose intolerance or diabetes by a blood glucose test at six to eight weeks postpartum and then one to two yearly (or by the ADIPS recommendation of having WHO OGTTs).

Before stopping contraception in preparation for another pregnancy, Mary should check that she has normal glucose tolerance (fasting venous plasma glucose <6.1 mmol/L, postprandial <7.8 mmol/L). If values are abnormal, further lifestyle intervention and insulin therapy may be required to bring them into the normal range. Mary is at high risk of developing gestational diabetes with future pregnancies and should be checked at 12 weeks, in the usual window of about 26 to 28 weeks and again at 32 weeks if this check is negative.

In the longer term, Mary is very likely to develop type 2 diabetes (40 to 80% risk in the next 10 years). She has two of the major risk factors (family history and previous gestational diabetes) and will achieve a third (age >40 years) in the next nine years (Table 3). It is recommended that she has regular follow up checks (see flowchart on page 49) and maintains the healthy lifestyle she adopted during her pregnancy, aiming at a healthy weight indefinitely. Given her family history of hypertension and the likelihood she has the metabolic syndrome (also called syndrome X, the insulin resistance syndrome – Table 5), her blood pressure and lipid profile should also be monitored.

Conclusion

A shared care multidisciplinary approach is important for success in the management of gestational diabetes. Target blood glucose levels are below 5.5 mmol/L before meals and below 7.0 mmol/L two hours after meals. Lifestyle modifications and insulin therapy may be needed to achieve these. Advice should be given on the risk of diabetes to the child, with future pregnancies and in the long term. MT

References

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