

Diabetes in Pregnancy

2014

Quick reference guide for
health professionals on the
screening, diagnosis and
treatment of gestational
diabetes in New Zealand

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Executive summary

Key priorities for implementation

Healthy lifestyle advice

- All pregnant women should be weighed and have their weight recorded at routine antenatal appointments.
- All pregnant women should be offered information covering the role of a healthy, balanced diet, body weight and exercise, including advice to be physically active for at least 30 minutes per day, most days of the week (The New Zealand Physical Activity Guidelines 2001).
- All pregnant women should be advised on avoiding excessive weight gain throughout their pregnancy (Ministry of Health 2014).
- The healthy lifestyle message should continue after birth.

Early pregnancy

- Every pregnant woman should be offered glycated haemoglobin (HbA1c), as a routine part of booking antenatal blood tests before 20 weeks.
This will identify women with probable undiagnosed diabetes or prediabetes and will help to identify women at high risk of developing gestational diabetes.
- Women with an HbA1c ≥ 50 mmol/mol should be referred directly to a service that specialises in diabetes in pregnancy as these women have probable undiagnosed diabetes.
- Women with an HbA1c 41–49 mmol/mol should be offered a two-hour, 75 g oral glucose tolerance test (OGTT) at 24–28 weeks.
These women are considered at an increased risk of gestational diabetes.

At 24–28 weeks' gestation

- The lead maternity carer (LMC) should offer an OGTT for women whose HbA1c was 41–49 mmol/mol at booking.
 - If fasting glucose is ≥ 5.5 mmol/L or two-hour value is ≥ 9.0 mmol/L, refer to services that specialise in diabetes in pregnancy.
- The LMC should offer a one-hour, 50 g oral glucose challenge test (polydose) for all women whose HbA1c was ≤ 40 mmol/mol at booking.
 - If glucose is ≥ 11.1 mmol/L, refer directly to services that specialise in diabetes in pregnancy without further testing.
 - If glucose is ≥ 7.8 –11.0 mmol/L, arrange a two-hour OGTT without delay.

After diagnosis of gestational diabetes

- All women with diabetes in pregnancy should be offered immediate contact with a service that specialises in diabetes in pregnancy and that offers tailored care, in addition to the care provided routinely by their LMC.
- At each appointment, women should be offered opportunities for information and education on diabetes, alongside additional recommended assessment of the fetus. Supporting written information should be culturally and ethnically appropriate.
- Blood glucose treatment targets are:
 - fasting blood glucose ≤ 5.0 mmol/L
 - one-hour post-prandial ≤ 7.4 mmol/L
 - two-hour post-prandial ≤ 6.7 mmol/L.
- Women with poor glycaemic control (meeting $< 10\%$ of treatment targets in a week), including those who do not respond to dietary and lifestyle interventions, should be offered pharmacological therapy with oral hypoglycaemics and/or insulin.
- Treatment should be reviewed by a specialist (possibly through a remote consultation) where more than 10% of blood glucose measurements exceed targets in one week.
- Ultrasound assessment of the fetus of women with gestational diabetes should be offered at the time of diagnosis and at 36–37 weeks. Further ultrasound scans should be based on clinical indication.

Treatment decisions should not be based solely on ultrasound findings as there is no evidence to suggest there is a benefit to maternal or fetal outcomes.

At the time of birth

- Pregnant women with diabetes who have a normally grown fetus with good blood glucose control throughout pregnancy should not routinely be offered elective birth before 40 completed weeks.
- Where women have poorly controlled diabetes ($> 10\%$ of blood glucose measurements outside of target ranges per week) and have an ultrasound diagnosed macrosomic fetus in the third trimester, an obstetrician should assess them for timing of birth.
- Vaginal birth is the preferred mode of delivery.
- Women diagnosed with gestational diabetes should discontinue hypoglycaemic treatment immediately after birth.
- Monitoring of women's blood glucose should continue for 24 hours following birth to rule out persisting hyperglycaemia before they are transferred to community care.
- The importance of contraception and the need for pre-conception care when women are planning future pregnancies should be discussed in the early postnatal period.

Neonatal care

- Babies born to mothers with diabetes should feed as soon as possible after birth (within 30 minutes). Skin to skin contact and breastfeeding are encouraged.
- Babies of women with diabetes should have their blood glucose routinely tested within one to two hours of birth to check for hypoglycaemia (blood glucose < 2.6 mmol/L).

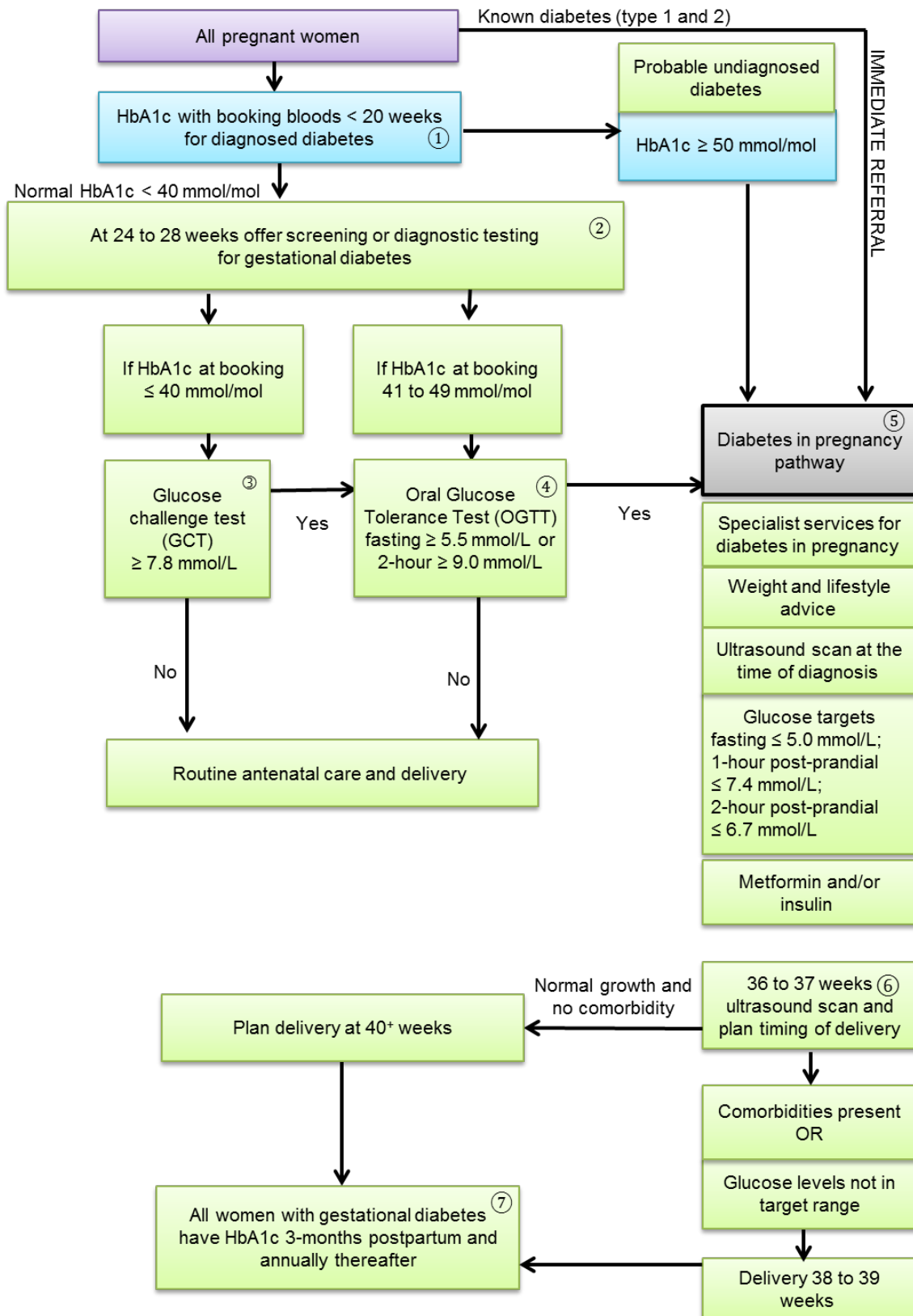
Follow-up of women with gestational diabetes

- Women who were diagnosed with gestational diabetes should be informed about the risks of gestational diabetes in future pregnancies, and of the increased risk of developing type 2 diabetes in their lifetime.
- These women should be offered lifestyle advice and an HbA1c measurement three months postpartum and annually thereafter.
 - HbA1c \geq 50mmol/mol confirms diabetes.
 - Where HbA1c is 41–49 mmol/mol, women will need a repeat test in three months.
- The postpartum OGTT is no longer routinely recommended.
- An OGTT reminder service for postnatal women in the community should be established to increase the uptake of this important screening test.
- Women with gestational diabetes should be offered yearly HbA1c checks.

Implications for planning services for women with gestational diabetes

- Specialist dietetic and laboratory services need to be established to manage the diagnoses of probable undiagnosed diabetes and gestational diabetes.
- General practitioners and midwives need to be educated on the guidance on screening for diabetes in pregnancy.

Flow chart for diabetes in pregnancy



1. **What is HbA1c?**
 - HbA1c (glycated haemoglobin) indicates the average blood glucose levels over the previous six to eight weeks.
 - It is a reliable method of detecting probable undiagnosed diabetes in the first 20 weeks of pregnancy.
 - An HbA1c of ≥ 50 mmol/mol suggests probable undiagnosed diabetes. Refer these women to specialist services for diabetes in pregnancy.
 - An HbA1c of 41 to 49 mmol/mol suggests prediabetes. Give these women dietary and lifestyle advice. In some local policies, they are also referred to specialist services.
2. **At 24 to 28 weeks gestation**
 - Women with a booking HbA1c of 41 to 49 mmol/mol should be offered a 75 g, two-hour oral glucose tolerance test (OGTT) due to an increased risk of gestational diabetes (some women with risk factors might be considered for OGTT based on local policies/prevalence levels) OR
 - All other women should be offered a 50 g, 1 hour oral glucose challenge test (polydose test) OR
 - Offer enrolment in the randomised trial of different diagnostic criteria. For details of the New Zealand GEMS Trial contact gems@auckland.ac.nz or go to www.ligginstrials.org/GEMS.
3. **Screening thresholds for gestational diabetes**
 - A value of the non-fasting oral glucose challenge test of ≥ 7.8 to 11.0 mmol/L requires a confirmatory oral glucose tolerance test for diagnosis of gestational diabetes.
 - If value ≥ 11.1 mmol/L refer to specialist services for diabetes in pregnancy.
4. **Diagnostic thresholds for gestational diabetes**
 - Values of the oral glucose challenge test of fasting ≥ 5.5 mmol/L or two hour post-prandial ≥ 9.0 mmol/L requires referral to specialist services for diabetes in pregnancy.
5. **Diabetes in pregnancy pathway**
 - Care is provided in consultation (including virtual clinics) with an obstetrician, a physician and a dietician as well as by the lead maternity carer (LMC).
 - Weight and lifestyle advice is ideally provided by a dietician or appropriately trained health professional.
 - Glucose targets during treatment are to achieve fasting ≤ 5.0 mmol/L; one hour post-prandial ≤ 7.4 mmol/L and two hour post-prandial < 6.7 mmol/L for more than 90% of readings during a week. Failure to meet these targets requires further consultation.
 - Metformin and/or insulin may be required where blood glucose treatment targets are unmet.
 - Fetal growth assessed by ultrasound should not be used to guide treatment as it is not reliable.
6. **Timing of delivery**
 - If ultrasound at 36 to 37 weeks reports normal fetal growth (< 90 th percentile) and there are no maternal or fetal comorbidities plan delivery at 40+ weeks.
 - If growth is > 90 th percentile or there are maternal and/or fetal comorbidities plan delivery for 38 to 39 weeks.
7. **Postpartum follow-up**
 - Women with gestational diabetes are at increased risk of type 2 diabetes.
 - At three months postpartum and annually thereafter, all women with gestational diabetes should have an HbA1c. The oral glucose tolerance test at six weeks postpartum is no longer required. This is consistent with screening of type 2 diabetes in adults in the New Zealand Primary Care Handbook (New Zealand Guidelines Group 2012).

Scope and purpose of the guideline

Purpose

This guideline provides evidence-based recommendations for the screening and diagnosis of both probable undiagnosed type 2 diabetes and gestational diabetes in pregnancy to improve neonatal and maternal outcomes. Recommendations on the treatment and management of gestational diabetes are also outlined.

Definitions for terms used in this guideline

The following terms are used throughout the document based on these definitions.

Diabetes in pregnancy – Any diagnosis of diabetes (type 1, type 2 or gestational diabetes) during a pregnancy.

Gestational diabetes – Diabetes that is first detected in pregnancy and resolves following the birth of the baby.

Probable undiagnosed diabetes – Diabetes (type 1 or type 2) that is first detected in pregnancy and that has often been referred to as gestational diabetes. However, blood glucose levels do not return to normal ranges following the birth and diabetes is confirmed following postpartum screening (HbA1c value of ≥ 50 mmol/mol).

Prediabetes – A state in which some but not all of the criteria are met for a diagnosis of diabetes (type 1 or type 2). It is often termed 'borderline diabetes' (HbA1c value of 41–49 mmol/mol). Abnormal glucose levels are likely to continue after pregnancy.

Borderline gestational diabetes – A state first identified in pregnancy in which some but not all of the criteria are met for a diagnosis of gestational diabetes. Blood sugar levels are likely to be controlled by diet and lifestyle alone and usually return to within normal ranges after birth.

Hyperglycaemia/glucose intolerance – 'Glucose intolerance' is used as an umbrella term for metabolic conditions resulting in higher than normal blood glucose levels – hyperglycaemia.

Type 1 diabetes – Usually diagnosed in childhood but can develop in adulthood. This is an autoimmune condition in which the body is unable to make insulin (or very little) and requires treatment with insulin.

Type 2 diabetes – Usually diagnosed in adulthood and is due to insufficient insulin being made by the body. Depending on the severity of the condition, treatment can include diet alone or in combination with oral hypoglycaemic drugs and/or insulin.

The need for the guideline

Approximately 61,000 women give birth in New Zealand each year and 4.9 of those women – 6.6% of pregnancies – have diabetes (Auckland District Health Board 2012; Statistics New Zealand 2012; provisional data from National Maternity Collection 2013). The prevalence of gestational, type 1 and type 2 diabetes is increasing, particularly among women of Māori, Pacific Island and South Asian ethnicity (Ministry of Health 2002).

The New Zealand Ministry of Health has identified a need for an evidence-based guideline because there are discrepancies, both nationally and internationally, in the screening and diagnosis of diabetes in pregnancy. As a result of variations in international diagnostic criteria, the prevalence of diabetes in pregnancy can range from 7.9% (Canadian Diabetes Association criteria) to 24.9% (Australian Diabetes in Pregnancy Society criteria) in the same group of women using the two-hour, 75 g oral glucose tolerance test (OGTT) (Agarwal et al 2005). In New Zealand there are local variations in the care given to women with diabetes in pregnancy and in the postpartum follow-up for both mother and infant.

Scope of the guideline

This guideline covers the antenatal screening for diabetes in pregnancy, including both probable undiagnosed diabetes and gestational diabetes. It covers the diagnostic criteria for the condition, its management antenatally and follow-up postpartum.

Although this guideline deals with the early detection of probable undiagnosed diabetes in pregnant women, it excludes the treatment and management of these women during pregnancy. It also does not cover the:

- management of women with pre-existing type 1 and type 2 diabetes in pregnancy
- intrapartum care of women with diabetes or medical emergencies associated with diabetes.

Target audience

This guideline is intended for care providers of women with gestational diabetes. It is also anticipated that this guideline will have implications for health service provider organisations, stakeholders of maternity services and stakeholders in primary and secondary care. In addition, it is accessible to the general public, patients and their families and whānau.

Treaty of Waitangi

The Guideline Development Team acknowledges the importance of the Treaty of Waitangi to New Zealand, and considers the Treaty principles of partnership, participation and protection as central to improving Māori health. As part of its commitment to the Treaty, it has consulted a Māori consumer and involved Māori health care practitioners in its work. Māori are also represented on the Guideline Development Team. The Guideline Development Team has specifically considered Māori health issues that are pertinent to the guideline and its implementation.

Guideline development process

The Ministry of Health commissioned the New Zealand Branch of the Australasian Cochrane Centre and the University of Auckland to develop this guideline. Together, they established a multidisciplinary Guideline Development Team, which reviewed the evidence and developed the recommendations.

Based on the quality of evidence, recommendations were graded as STRONG or CONDITIONAL. Where insufficient evidence was present to make a recommendation, or in areas where narrative review had been conducted, a good practice point (GPP) was made instead. Research recommendations have been made in areas where there is a lack of high-quality evidence on which to make a recommendation.

Funding of the guideline

The guideline has been commissioned and funded by the Ministry of Health. A representative of the Ministry of Health attended each Guideline Development Team meeting in an ex officio capacity and had no influence over the development of clinical recommendations.

Summary of recommendations

The evidence-based recommendations developed by the Guideline Development Team are summarised below.

1 Screening for probable undiagnosed diabetes in early pregnancy using HbA1c

The prevalence of type 1, type 2 and gestational diabetes in New Zealand is rising. A large proportion of women in the population have risk factors for gestational diabetes and probable undiagnosed diabetes. In screening all pregnant women before 20 weeks' gestation using glycated haemoglobin (HbA1c), the aim is to identify women at high risk of diabetes in pregnancy.

This guideline has used the HbA1c reference ranges from the New Zealand Society for the Study of Diabetes to categorise women with probable undiagnosed diabetes and women at high risk of gestational diabetes (www.nzssd.org.nz). Although there are no published randomised controlled trials on the use of HbA1c in early pregnancy to diagnose diabetes, observational studies support its use.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
1 Offer all women an HbA1c test in their 'booking' antenatal bloods to detect undiagnosed diabetes.	CONDITIONAL	Chapter 2
2a Women with HbA1c \geq 50 mmol/mol should be under the care of a service that specialises in diabetes in pregnancy.	CONDITIONAL	Chapter 2
2b All women with HbA1c 41–49 mmol/mol should receive dietary and lifestyle advice and have an oral glucose tolerance test at 24–28 weeks.	GPP	Chapter 2
3 Do not offer an HbA1c as a diagnostic test for gestational diabetes as it is not sensitive enough to detect gestational diabetes.	CONDITIONAL	Chapter 2

Research recommendation: Randomised controlled trial comparing dietary and lifestyle advice with pharmacotherapy for women whose HbA1c at booking is in the range of 41–49 mmol/mol in terms of their impact on maternal and infant outcomes and development of gestational diabetes.

Research recommendation: Studies that show early diagnosis and treatment improve maternal and infant outcomes.

2 Diagnosis of gestational diabetes at 24–28 weeks

This guideline has selected the 75 g OGTT for women with an HbA1c of 41–49 mmol/mol, rather than the 50 g oral glucose challenge test, as evidence suggests that the positive predictive value of the 50 g test is variable (Hartling et al 2012).

This guideline chose not to adopt the International Association of Diabetes and Pregnancy Study Groups' criteria (one-step strategy) (Nankervis 2014) as there is no randomised controlled trial evidence to support its use. However, there is an urgent need for a high-quality randomised controlled trial to compare current practice in New Zealand with these criteria for treatment of pregnant women with diabetes. Until this evidence is available, the current two-step diagnostic strategy for diagnosing diabetes in pregnancy will continue in New Zealand.

All women considered at high risk for gestational diabetes (with HbA1c at booking 41–49 mmol/mol) should be offered the one-step diagnostic oral glucose tolerance test at 24–28 weeks' gestation.

All other women should be offered screening for gestational diabetes with the one-hour, 50 g oral glucose challenge test followed by oral glucose tolerance test (if the challenge test is positive) known as a two-step strategy.

Consider enrolment in the randomised trial of different diagnostic criteria. For further details of the New Zealand GEMS Trial contact gems@auckland.ac.nz.

All women should be informed that the 50 g glucose challenge test can be falsely normal in approximately 20% of women with gestational diabetes. Women undergoing the test should also be informed that if the result is abnormal, they will be invited to undertake the 75 g OGTT to confirm gestational diabetes.

Due to the lack of good-quality evidence for the optimal screening of women for gestational diabetes at 24–28 weeks' gestation, the recommendations in this area are good practice points only.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
At 24–28 weeks		
<p>4 For all women not previously diagnosed with diabetes who are at high risk of gestational diabetes (HbA1c of 41–49 mmol/mol), offer a two-hour, 75 g oral glucose tolerance test.</p> <ul style="list-style-type: none"> If fasting glucose is ≥ 5.5 mmol/L or two-hour value is ≥ 9.0 mmol/L, refer the woman to a diabetes in pregnancy clinic. 	GPP	Chapter 3
<p>Offer all other women a one-hour, 50 g, oral glucose challenge test.</p> <ul style="list-style-type: none"> If glucose is ≥ 11.1 mmol/L, refer directly to diabetes in pregnancy clinic without further testing. If glucose ≥ 7.8 mmol/L to < 11.0 mmol/L, then arrange a 75 g, two-hour oral glucose tolerance test without delay. 	GPP	
Consider enrolment in the randomised trial of different diagnostic criteria.*		
<p>5 If the fasting or two-hour values are borderline and there are risk factors for gestational diabetes, consider self-monitoring of blood glucose levels weekly.</p>	GPP	Chapter 2 (section 2.3) – risk factors Chapter 3
<p>Research recommendation: A randomised controlled trial that compares current screening and diagnostic criteria with those proposed by the International Association of Diabetes and Pregnancy Study Groups in terms of their impact on maternal and infant outcomes is required.</p>		

* For further details of the New Zealand GEMS Trial contact gems@auckland.ac.nz.

3 Prevention of gestational diabetes

The evidence on prevention of gestational diabetes is of poor quality. Exercise alone does not appear to be an effective intervention. There is some limited evidence that dietary interventions are effective at reducing the risk of gestational diabetes and the risk of having large for gestational age infants.

Combined dietary and exercise interventions do not appear to be effective in reducing the incidence of gestational diabetes. There is limited evidence that lifestyle interventions can reduce the risk of a woman having a large for gestational age infant.

This guideline has recommended that all pregnant women are encouraged to maintain a healthy lifestyle. Advice on diet, calorie intake and exercise should be freely available and openly discussed between the woman and her care provider. The Ministry of Health (2014) guidelines on weight gain during pregnancy should be used as a tool to help guide pregnant women and their health care providers on what is an appropriate amount of weight to gain (Table 1).

Green prescriptions may be useful for pregnant women at high risk of diabetes secondary to obesity.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
6 Encourage all women and their families to eat a balanced, healthy diet with appropriate calorie intake to prevent the onset of gestational diabetes prior to and during pregnancy. Discuss how they could make their diet healthier, taking account of their needs, preferences and individual circumstances.	CONDITIONAL	Chapter 4
7 Encourage all women to be physically active for at least 30 minutes most days of the week (this can be in 10-minute blocks) in the absence of medical contra-indications.	GPP	Chapter 4
8 Measure and record maternal weight at routine antenatal visits.*	GPP	Chapter 4

Note: * Refer to Table 1 below for Ministry of Health guidelines.

Table 1: Ministry of Health guidelines on weight gain during pregnancy

Pre-pregnancy body mass index	Body mass index (kg/m²)*	Total weight gain range (kg)
Underweight	< 18.5	12.7 to 18.1
Normal weight	18.5 to 24.9	11.3 to 15.9
Overweight	25.0 to 29.9	6.8 to 11.3
Obese (includes all classes)	≥ 30.0	5.0 to 9.0

Source: Ministry of Health (2014); Institute of Medicine (2009)

4 Treatment of women with gestational diabetes

All women diagnosed with gestational diabetes should be offered treatment with specialised dietary and lifestyle advice. There is good evidence through randomised controlled trials to suggest this treatment improves maternal, fetal and neonatal outcomes.

Current evidence suggests that oral hypoglycaemic drugs (in particular metformin) are as effective as, and carry no greater harms than, insulin therapy in women with gestational diabetes. The use of oral hypoglycaemic medication may be more acceptable to women than injecting insulin. The adverse effects associated with oral hypoglycaemics and insulin were not adequately discussed in these trials.

The evidence for exercise alone as an intervention to treat women diagnosed with gestational diabetes is limited in quality and volume. The type of exercise described is mainly 'supervised' exercise (resistance training and use of equipment not readily available to most women). There is a paucity of trials that examine the effect of 'unsupervised' or leisure time activity (www.health.govt.nz/your-health/healthy-living/food-and-physical-activity/physical-activity).

It is rare for treatment intervention trials on women diagnosed with gestational diabetes to describe the long-term follow-up findings on women and their infants. Information on the development of type 2 diabetes, childhood obesity, and cost implications for the different treatments is also lacking.

The evidence for optimal glucose targets for women with gestational diabetes is limited and of varying quality. It appears that women who have better-controlled blood sugars in pregnancy have a lower incidence of pre-eclampsia and large for gestational age babies. The infants of these women have a reduced incidence of neonatal hypoglycaemia and perinatal mortality.

Feedback during consultation highlighted issues surrounding the accuracy of self-monitored blood glucose levels. Health professionals should not rely solely on self-reported readings but should download data from blood glucose meters wherever possible.

The evidence for the management and treatment of gestational diabetes based on fetal ultrasound measurement is unclear. There is no evidence to support intensified ultrasound scanning throughout pregnancy to guide treatment in gestational diabetes.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
9 Offer all women diagnosed with gestational diabetes ongoing treatment by health professionals, including specialised dietary advice, lifestyle advice and educational material that is culturally and ethnically appropriate.	STRONG	Chapter 5 (section 5.2)
10 Advise pregnant women with gestational diabetes that their dietary recommendations could include: <ul style="list-style-type: none"> • consuming a minimum of 175 g carbohydrate per day • spreading carbohydrates evenly throughout the day between meals and snacks • reducing intake of saturated fats • consuming lean protein • keeping weight gain in pregnancy in line with Ministry of Health recommendations.* This recommendation is dependent on individual requirements.	GPP	Chapter 5 (section 5.4)
11 Where women who have gestational diabetes and poor glycaemic control (above treatment targets) in spite of dietary and lifestyle interventions, offer oral hypoglycaemics (metformin or glibenclamide) and/or insulin therapy. In deciding whether to use oral therapy or insulin, take account of the clinical assessment and advice, and the woman's preferences and her ability to adhere to medication and self-monitoring.	STRONG	Chapter 5 (section 5.5)
12 Treatment targets for capillary glucose are: <ul style="list-style-type: none"> • fasting glucose ≤ 5.0 mmol/L • one-hour post-prandial** ≤ 7.4 mmol/L • two-hour post-prandial** ≤ 6.7 mmol/L. 	GPP	Chapter 5 (section 5.6)
13a Women with 10% of readings (three to four readings) above the treatment targets should have their treatment reassessed.	GPP	Chapter 5 (section 5.8)
13b Discuss high postprandial blood glucose levels with the woman to establish what she had eaten for that meal.		
14 Offer women with gestational diabetes an ultrasound scan at the time of diagnosis and at 36–37 weeks. Further ultrasound scans should be based on clinical indications. Treatment decisions should not be based solely on fetal ultrasound.	CONDITIONAL	Chapter 5 (section 5.7)

Research recommendation: A randomised controlled trial to compare tight with less tight glycaemic control in women diagnosed with gestational diabetes in terms of their impact on maternal and infant outcomes.

Research recommendation: A randomised controlled trial comparing more intensive ultrasound scanning with usual care in women with gestational diabetes in terms of their impact on maternal and infant outcomes.

Research recommendation: A randomised controlled trial of leisure activity interventions for the treatment of gestational diabetes.

Note: * Ministry of Health (2014).

** After the start of eating.

5 Timing and mode of birth

The evidence on the optimal timing and mode of birth for women diagnosed with gestational diabetes is of very poor quality. It is based mainly on a solitary trial conducted in the 1990s, which found that active induction of labour at 38 weeks' gestation resulted in fewer macrosomic and large for gestational age infants when compared with expectant management of labour. There was no evidence of any adverse effect on maternal morbidity as measured by caesarean section rate.

Very low-quality evidence from observational studies also suggests that induction of labour resulted in decreased fetal macrosomia and shoulder dystocia when compared with elective caesarean. There is insufficient evidence to suggest the gestational age at which elective delivery should be considered.

There is no evidence on the cost-effectiveness of induction of labour or expectant management for women with gestational diabetes. Given the number of women with gestational diabetes is increasing, there would be additional costs if these women underwent elective delivery rather than spontaneous birth in the absence of obstetric complications. Reducing the number of unnecessary elective caesarean sections benefits both the mother and the health service provider.

Recommendations on the timing and mode of birth in this guideline are good practice points given the paucity of good-quality evidence on this topic.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
15 Recommend vaginal birth for women with gestational diabetes whose pregnancy is progressing well, with good glycaemic control ($\geq 90\%$ of glucose readings within treatment targets), normal fetal growth (≥ 10 th to ≤ 90 th percentile) and no clinical/obstetric contra-indications.	CONDITIONAL	Chapter 6 (section 6.2)
16 Planned delivery before 40 weeks is not recommended for women who have gestational diabetes with good glucose control ($\geq 90\%$ of blood glucose readings within treatment targets) unless there are other comorbidities present.	GPP	Chapter 6 (section 6.3)
17 Assess timing of birth individually where women have poorly controlled gestational diabetes ($< 90\%$ of blood glucose readings within treatment targets) or there are other maternal or infant comorbidities (including hypertension, pre-eclampsia, large for gestational age infant > 90 th centile, maternal age > 40 years).	GPP	Chapter 6
18 Advise women to report any reduction or change in fetal movements from 28 weeks' gestational age onwards.	GPP	Chapter 6

6 Immediate postpartum care

Evidence supports early initiation of breastfeeding in women with gestational diabetes to prevent neonatal hypoglycaemia as well as to promote maternal bonding with the infant. Early skin to skin contact between the infant and mother is important in helping to establish breastfeeding.

The current internationally accepted definition of neonatal hypoglycaemia is < 2.6 mmol/L. Where neonatal hypoglycaemia is diagnosed, frequent breastfeeding as a first option should be started and a referral made to the neonatal team. Diagnostic methods sensitive enough to detect low glucose levels in neonatal blood (eg, glucose oxidase methods) are vital.

After birth, women with gestational diabetes should not need ongoing pharmacological intervention. Capillary monitoring of maternal fasting and postprandial blood glucose should continue until values normalise. A woman should be referred to a medical team if blood glucose levels do not normalise as anticipated. Health professionals should reiterate the healthy diet and lifestyle advice given in pregnancy and encourage the woman to follow it postnatally.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
19 Encourage women diagnosed with gestational diabetes to start breastfeeding and have skin to skin contact as early as possible after birth (preferably within one hour).	GPP	Chapter 7 (section 7.2)
20 Encourage mothers diagnosed with gestational diabetes to feed their infants frequently (every two to three hours) during the first 48 hours after birth.	GPP	Chapter 7 (section 7.2)
21 Measure the infant's plasma glucose at one to two hours of age, four hours, and then four-hourly, preferably before feeds, until there have been three consecutive readings > 2.6 mmol/L.*	GPP	Chapter 7 (section 7.3)
22 For infants with blood glucose levels < 2.6 mmol/L: <ul style="list-style-type: none"> • offer supplementary breastfeeds where possible • if blood sugar levels remain < 2.6 mmol/L for two consecutive readings one hour apart, refer the infant to the neonatal team • if any reading is ≤ 2.0 mmol/L, refer immediately to the neonatal team. 	GPP	Chapter 7 (section 7.3)
23 Monitor the blood glucose of women who have been diagnosed with gestational diabetes before breakfast (fasting blood sugar) and two hours after meals for 24 hours after delivery. Refer to the medical team if values are between 7 mmol/L and ≥ 11 mmol/L on two consecutive occasions. If blood glucose levels are within normal range, stop monitoring after 24 hours.	GPP	Chapter 7 (section 7.4)
24 Discontinue diabetes medication for women with a diagnosis of gestational diabetes at birth.	GPP	Chapter 7 (section 7.5)

Note: * An appropriately sensitive method, such as the glucose oxidase method, should be used to test for neonatal hypoglycaemia. Accucheck is not sensitive enough and should not be used to measure neonatal blood glucose.

7 Information and follow-up

There is good evidence to suggest that early breastfeeding is beneficial for mothers diagnosed with gestational diabetes and their infants. There is currently insufficient evidence to recommend that mothers with gestational diabetes feed their babies with breast milk that they expressed antenatally.

Good practice points have been made on the postnatal discussion of contraception, the risk of developing type 2 diabetes and the reduction in risk factors for type 2 diabetes in women who were diagnosed with diabetes in pregnancy.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
25 Encourage and support women with gestational diabetes to exclusively breastfeed for a minimum of six months.	GPP	Chapter 8 (section 8.2)
26 Encourage women who are unable to breastfeed, or do not wish to breastfeed, to use donor breast milk before formula milk. The decision should be based on maternal preference.	GPP	Chapter 8 (section 8.2)
27 There is currently insufficient evidence to recommend the use of antenatal breast milk expression for women with gestational diabetes	GPP	Chapter 8
28 Discuss methods of contraception agreeable with the woman and her partner and prescribe contraceptives based on maternal risk factors for cardiovascular disease, in the early postnatal period.	GPP	Chapter 8 (section 8.3)
29 Inform women diagnosed with gestational diabetes of the increased risk of gestational diabetes in a subsequent pregnancy and the increased risk for developing type 2 diabetes.	GPP	Chapter 8
30 Inform women (in particular those who are obese or overweight) that they can reduce their risk of recurrent gestational diabetes or type 2 diabetes by maintaining a healthy, balanced diet and increasing physical activity at moderate levels.	GPP	Chapter 8 (section 8.4)

8 Postpartum screening

For women diagnosed with diabetes in pregnancy, the 75 g OGTT is the most accurate test for diagnosing glucose intolerance, including diabetes, in the first year following birth. However, the uptake of the test is low: 30–70% of these women do not have the test. The nature of the test may be unacceptable to many mothers as it is time consuming and requires a fasting blood sugar and multiple blood samples.

Early postpartum testing with HbA1c at 6–12 weeks is not recommended due to the influence of antepartum treatment of hyperglycaemia (American Diabetes Association 2013). It is more logical to perform the test at approximately three months postpartum. The use of HbA1c may miss a number of women with lower levels of hyperglycaemia, but will detect women with the highest glucose levels who require immediate assessment. A fasting glucose can be added (on an individual basis) to increase the sensitivity of the test.

HbA1c is currently used to screen for diabetes in New Zealand in the non-pregnant population. It is likely that the general practitioner will undertake a more appropriate follow-up and continue surveillance if an initial HbA1c is performed. How HbA1c measurements progress over time is an important concept that cross-sectional studies do not capture. The initial test helps to engage the woman and her general practitioner in the process of regular follow-up testing and review of healthy lifestyle interventions (+/- metformin). The majority of guidelines recommended annual follow-up testing in women with a history of gestational diabetes.

Although interventions to increase postpartum screening have been successful, the overall rates of postpartum screening remain suboptimal. To detect and treat women who develop diabetes or impaired glucose tolerance following gestational diabetes, and in this way to prevent future complications associated with the condition, it is important to screen and diagnose women in a timely fashion.

Postpartum screening in women with gestational diabetes provides an opportunity to identify women with undiagnosed diabetes and to begin surveillance of specific individuals at increased risk of developing diabetes in the future. Through a variety of media, women should be informed about the importance of postpartum screening for diabetes following gestational diabetes. The reasons why many women do not attend postpartum screening in New Zealand need to be explored further.

All health care providers involved in a woman's care need to give consistent messages about the need for postnatal screening. Postnatally, one particular health professional should take on the responsibility for ensuring that their patient with gestational diabetes receives the relevant information and paperwork required to undertake the screening test at three months postpartum and annually thereafter. Reminder systems appear to be a useful method for increasing postpartum screening rates.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
31 For all women diagnosed with gestational diabetes, their lead maternity carer or diabetes clinic in the postnatal review should provide printed information about the importance of postpartum screening and the risk of developing type 2 diabetes.	CONDITIONAL	Chapter 9
32 Remind all women with gestational diabetes and their primary care provider (at the time of hospital discharge) of the need to participate in screening three months after birth.	CONDITIONAL	Chapter 9
33 The primary care provider of women with gestational diabetes should offer them screening for type 2 diabetes at three months postpartum using HbA1c. If the value is: <ul style="list-style-type: none"> • ≤ 40 mmol/mol, the result is normal. Repeat the test in one year • 41–49 mmol/mol (prediabetes or impaired fasting glucose), advise on diet and lifestyle modification. If the woman is over 35 years, a full cardiovascular risk assessment and appropriate management are indicated. Repeat test after six months • ≥ 50 mmol/mol and symptomatic ‘diabetes’, refer to medical specialist • ≥ 50 mmol/mol and asymptomatic, repeat HbA1c or fasting plasma glucose.* 	GPP	Chapter 9 (section 9.3)
34 The primary health organisation performance programme should be used to encourage primary care practitioners to record postpartum gestational diabetes screening.	GPP	Chapter 9

Note: * Two results above the diagnostic cut-offs are required for diagnosis of diabetes if the woman is asymptomatic.

9 Gestational diabetes and risk of type 2 diabetes

The cumulative risk of developing type 2 diabetes following gestational diabetes has been estimated to be as high as 50% depending on ethnicity and time from index pregnancy. The risk is estimated to be six to eight times higher in women who were diagnosed with gestational diabetes than in women with no history of gestational diabetes.

There is good evidence that the risk of developing type 2 diabetes can be reduced by either lifestyle or pharmacological interventions in the non-pregnant population. Only one trial provides the evidence on the effectiveness of these interventions in women diagnosed with gestational diabetes (Ratner et al 2008).

More research is needed to guide clinical practice postnatally, particularly in regard to pharmacological treatment and lifestyle interventions for women with a history of gestational diabetes. Healthy lifestyle advice should continue in the postnatal period. Green prescriptions for women at high risk of developing diabetes may help.

Recommendation	Strength of recommendation or good practice point (GPP)	Where to refer in guideline
35 Consider metformin in women (with previous gestational diabetes) who have HbA1c 41–49 mmol/mol and who are not successful with lifestyle modification (in particular those planning another pregnancy).	CONDITIONAL	Chapter 10
36 Provide women diagnosed with gestational diabetes with lifestyle and dietary advice and advise on how to maintain a healthy weight.	CONDITIONAL	Chapter 10
37 Inform women with a previous diagnosis of gestational diabetes and/or prediabetes of the risk of gestational diabetes and offer early pre-pregnancy screening for diabetes when they are planning future pregnancies.	GPP	Chapter 10

Research recommendation: Randomised controlled trials that evaluate the outcomes of lifestyle versus pharmacological interventions to prevent type 2 diabetes in women with a previous history of gestational diabetes.

Implementation of the guideline

This guideline has provided specific recommendations for clinical practice in the screening, diagnosis, management and follow-up of women with gestational diabetes in New Zealand. It has also made a number of key research recommendations in areas where evidence is insufficient.

A full implementation plan has been submitted to the Ministry of Health. It includes:

- a dissemination plan for the full guideline and summary versions
- a PowerPoint presentation describing the key recommendations of the guideline, which can be downloaded
- recommendations for promoting the recommendations to key stakeholder groups including pregnant woman, Māori and Pacific communities, health care workers and maternity service providers
- an algorithm for health professionals, which can be downloaded
- suggestions for incorporating the guideline recommendations into a range of contexts, such as conference programmes, journal articles, continuing education programmes and online quizzes.

In evaluating the implementation of this guideline, performance indicators are the:

- percentage of women offered an HbA1c as part of the routine early pregnancy blood tests (< 20 weeks)
- percentage of women having the oral glucose tolerance test or oral glucose challenge test at 24–28 weeks
- percentage of women with gestational diabetes who are then offered an HbA1c 12 weeks after the birth of their child
- number of green prescriptions issued to women with diabetes in pregnancy
- results from monitoring the levels of labour inductions and caesarean sections and Neonatal Intensive Care Unit admissions for women with gestational diabetes and their babies.

In addition, to assess uptake of the guidelines, information could be collected on the number of:

- people who download or order copies of the guidelines and summaries
- health practitioners attending education sessions and workshops and successfully completing online quizzes
- people downloading tools such as apps.

It is proposed that the guideline is updated in a minimum of three years. At this point the Guideline Development Team should focus on any new randomised controlled trial evidence on the screening, diagnosis and treatment of diabetes diagnosed in pregnancy, focusing on maternal and fetal outcomes.

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