Screening of diabetes in pregnancy in New Zealand: translation of national guidelines into practice

Nuoya Fang, Roshini Peiris-John, Michelle R Wise

ABSTRACT

BACKGROUND: Diabetes in pregnancy represents a significant risk for adverse pregnancy outcomes and implications for the future maternal and child health. Disparities in screening rates and discrepancies in clinical practice led to development of the New Zealand Ministry of Health Guideline on screening and management of gestational diabetes (GDM) in 2014.

AIM: To evaluate the proportion of pregnant women who completed screening for pre-existing diabetes and GDM, following publication of the Guideline.

METHODS: A stocktake was conducted of clinical audits by University of Auckland medical students in nine New Zealand public hospitals between 2015 and 2021. Audits were included if they investigated whether women who gave birth were screened for diabetes in pregnancy according to Guideline recommendations.

RESULTS: Nineteen audits of 3213 women investigated the screening rates for (1) pre-existing diabetes, by 20 weeks’ gestation, using HbA1c \( [n=16] \); (2) oral glucose tolerance test, OGTT, follow up of abnormal HbA1c at 24–28 weeks’ \( [n=4] \); (3) glucose challenge test, GCT, at 24–28 weeks’ \( [n=9] \); and (4) OGTT follow-up of abnormal GCT \( [n=10] \). There was improvement in HbA1c screening, from 28% in 2015 to 84% in 2020. OGTT testing rates were high in all audits. Māori had lower rates of screening for GDM (standards 2 & 3) than non-Māori (62% versus 86%, \( p<0.05 \); 3 audits, \( n=837 \)).

CONCLUSIONS: The national guideline made a positive contribution to the quality of care provided, however, further targeted interventions need to be implemented to meet the standard of care, especially for Māori women.

The prevalence of gestational diabetes mellitus (GDM) and pre-existing diabetes is increasing in Australia and Aotearoa New Zealand.\(^1\)\(^-\)\(^3\) Indigenous populations in both countries are disproportionately overrepresented among women with diabetes in pregnancy, including Māori \( (5.7\% \text{ cf. } 2.5\% \text{ NZ European women}) \) and Aboriginal and Torres Strait Islanders \( (\text{pooled prevalence odds ratios of Indigenous cf. non-Indigenous women for pre-existing diabetes were } 3.63 \text{ and } 1.42 \text{ for GDM})\).\(^4\)

Appropriate and timely screening and treatment improves maternal and foetal complications.\(^5\)\(^-\)\(^6\)

Missed opportunities for the detection and management of diabetes in pregnancy have ongoing health consequences for mothers and babies.\(^7\)

In New Zealand, discrepancies in clinical practice and the increasing prevalence of diabetes in pregnancy led to the publication of a clinical practice guideline for gestational diabetes in 2014 by the Ministry of Health (MoH).\(^2\) The guideline provides evidence-based recommendations for the screening, diagnosis and management of GDM in order to improve maternal and infant outcomes. This was quickly taken up by many district health boards (DHBs) across the country, however, some local DHB guideline variations remain.

The purpose of this study is to evaluate the proportion of pregnant women who completed screening for both pre-existing diabetes (using HbA1c) and GDM (GCT or OGTT as indicated) based on the recommendations stated in 2014 MoH guideline.

Methods

At University of Auckland, Year 6 medical students conduct a clinical audit during their Obstetrics and Gynaecology clinical placement in one of nine public hospitals in New Zealand. These hospitals range from regional hospitals with 1,500 births annually to urban hospitals with around 7,000. Students assess hospital performance around a chosen audit topic, select best practice standard/s of care from existing clinical recommendations, or evidence-based guidelines and write a standardised report with de-identified aggregated patient data. Reports are uploaded to the university student learning website.
Study populations of pregnant women are selected by either block sampling within a limited period (e.g., one month) or random sampling over a longer timeframe (e.g., one year) through hospital records or databases. Relevant data are collected through clinical notes, hospital electronic patient information systems, discharge summaries, and/or clinic letters.

For this review, the repository of student audit reports completed between 2015 and 2021 was searched to identify those investigating screening for diabetes in pregnancy, using the key words “antenatal screening” and “gestational diabetes”. All audits assessing any of the standards noted below were included.

**Screening for pre-existing diabetes**

- Standard 1: Offer all women an HbA1c test in their “booking” antenatal bloods to detect undiagnosed diabetes (ideally before 20 weeks).

**Screening for GDM**

- Standard 2: At 24–28 weeks, 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, 75g oral glucose tolerance test (OGTT).
- Standard 3: At 24–28 weeks, offer all other women a one hour, 50g, oral glucose challenge test (GCT).
- Standard 4: If glucose ≥7.8mmol/L to <11.0mmol/L, then arrange a 75g, two hour OGTT without delay.

Each standard was analysed using a run chart showing proportion of adherence over time. Analysis of the run charts required the addition of median lines so that the four run rules (i.e., shift, trend, too many/too few runs, and astronomical point) could be used to identify any non-random signals which may indicate a special cause of variation. The first three probability-based rules enable objective analysis based on an error of p<0.05. Rules one and three require more than 10 data points before they are applicable.

Some reports provided data on screening rates by ethnicity, which were collated and reported in the current study for Māori vs non-Māori, based on how reports presented this information. For each audit, proportions were calculated by number of Māori participants screened/total number of Māori participants included in the audit. A Chi-squared test of independence was performed using data from the audits to examine the relationship between ethnicity and screening of pre-existing diabetes.

Ethics approval for the study was received from the Auckland Health Research Ethics Committee on 23 March 2021 (AHREC Ref. AH22104).

**Results**

Twenty-five audits were identified during the study period; six were excluded due to inadequate data provided, leaving 19 audits for analysis (Table 1).

### Screening for pre-existing diabetes—Standard 1

Sixteen audits (of 2,376 participants) evaluated the proportion of women who had HbA1c testing <20 weeks’ gestation. In 2016, a shift can be seen from below to above the median, indicating there was a significant increase in the proportion of pregnant women who met the standard of care (from 28% in 2015 to 84% in 2020) (Figure 1). Overall, the proportion who met the standard of care was greater for women in urban sites (average 70% across eight audits) cf. to rural sites (average 48% across nine audits).

Increases were seen in the proportion of women who had HbA1c testing over time, for hospital sites where more than one audit was done. For example, at four sites where audits were performed longitudinally, there was at least a 24% increase from the previous reported audit. At Site 1, testing rates improved from 15% in 2015 to 93% in 2016. At Site 2, testing rates went from 47% in 2016 to 84% in 2019. At Site 6 rates went from 16% in 2015 to 73% in 2019. At Site 7, rates went from 16% in 2015 to 40% in 2016.

### Screening for GDM—Standard 2

Four audits, all based at regional sites, evaluated the proportion of women with HbA1c 41–49 mmol/mol who had an OGTT at 24–28 weeks. Each included only one to four women, thus, no conclusions could be reached.

### Screening for GDM—Standard 3

Two audits evaluated the proportion of women with normal HbA1c who had a GCT at 24–28 weeks’ gestation, and another seven included all women in the sample (Figure 2). We were unable to test for significance as there were not enough data points. Overall, the proportion who met the standard of care was slightly greater for women in rural sites (average 44% across seven audits) cf. to urban sites (average 41% across two audits).
### Table 1: Summary of audits investigating screening of diabetes in pregnancy, by site.

<table>
<thead>
<tr>
<th>Hospital setting</th>
<th>Year</th>
<th>Sampling strategy</th>
<th>Sample size</th>
<th>Māori participants</th>
<th>BMI ≥25 at booking</th>
<th>Standard/s assessed†</th>
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<td>87</td>
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</table>

† Standard 1. All women offered an HbA1c test in their “booking” antenatal bloods to detect undiagnosed diabetes (ideally before 20 weeks); Standard 2. At 24–28 weeks, for all women not previously diagnosed with diabetes who are at high risk of gestational diabetes (HbA1c 41–49 mmol/mol), offer a two hour, 75g oral glucose tolerance test (OGTT); Standard 3. At 24–28 weeks, offer all other women one hour, 50g, oral glucose challenge test; Standard 4. If glucose ≥7.8mmol/L to <11.0mmol/L, then arrange 75g, two hour OGTT without delay.
**Figure 1:** Standard 1; HbA1c testing before 20 weeks' gestation over time.

![Graph showing HbA1c testing over time](image)

*HbA1c within first trimester.

**Figure 2:** Standard 3; glucose challenge test (GCT) at 24–28 weeks' gestation, over time.

![Graph showing GCT over time](image)

*HbA1c <41.
Screening for GDM—Standard 4

Ten audits (of 1,724 participants) evaluated the proportion of women who had an OGTT without delay following an indeterminate GCT. Testing rates were high overall (range 34%–100%, median of 92%), with two audits meeting 100%. No non-random variation was found. Overall, the proportion who met the standard of care was greater for women in rural sites (average 85% across eight audits) cf. to urban sites (average 73% across three audits).

Screening rates by ethnicity

Standard 1: four audits evaluated screening for pre-existing diabetes using HbA1c by ethnicity and found no differences between Māori and non-Māori. The average screening rate for Māori was 53%, compared to 49% for non-Māori, X²(1, N=955)=1.37, p=0.242. In one site (Site 2) there was improvement in both groups over time (in 2016, 34% for Māori, 35% for non-Māori; in 2019–2020, 86% for Māori, 82% for non-Māori).

Standards 2,3,4: three audits evaluated screening rates for GDM (i.e., GCT or OGTT) by ethnicity, and differences were found between Māori and non-Māori. Māori (n=341, 62%) were less likely than non-Māori (n=496, 86%) to be screened for GDM, X²(1, N=837)=65.36, p<0.001, with odds ratio=0.72. In one site (Site 7) there was no improvement over time (in 2017, 65% for Māori vs 84% for non-Māori; in 2020, 58% for Māori vs 85% for non-Māori).

Discussion

A review of 19 audits conducted at nine New Zealand public hospitals from 2015 to 2021 following the publication of the national guideline on GDM in 2014 found significant improvement over time in screening for pre-existing diabetes at less than 20 weeks’ gestation using HbA1c. Moreover, around 92% of women whose GCT result indicated an OGTT, had one.

An audit by the national GDM Committee found that in 2005, screening for GDM using GCT varied by DHB, from 20% to 89% of pregnancies. Another audit conducted in the Bay of Plenty Region in 2013/2014 provides an indication of baseline screening rates in New Zealand prior to the 2014 national guideline. Of 656 women who gave birth, 12% had an HbA1c test and 57% underwent a GCT between 24 and 28 weeks’ gestation. This compares to a 2012 survey of healthcare providers in Australia conducted prior to the introduction of new Australian diabetes in pregnancy guidelines, where they made a new recommendation for an OGTT to be done at the first antenatal visit. They found that 66% of respondents offered diabetes screening at the first antenatal visit, 21% included an HbA1c screen, and 43% an OGTT. However, this study was based on provider self-report, unlike the current study.

A lower GDM screening rate in Māori women (cf. non-Māori) was reported in the Bay of Plenty audit referred to above where GDM screening rates were 56% for Māori and 76% for non-Māori (p<0.001). Similar findings are reported in an observational study of 11,246 women in Christchurch, recorded during 2008–2010, where 39% of Māori were screened for GDM compared to 55% of European women [IPR 0.71 (0.66–0.77)]. The authors concluded that the introduction of routine HbA1c testing with the first-antenatal bloods would increase the proportion of women screened for diabetes in pregnancy among Māori by 40% (two-fold increase). This appears to have occurred—in our study, the HbA1c screening rates under 20 weeks’ gestation were similar for Māori and non-Māori women. However, the screening rates for GDM at 24–28 weeks were still lower for Māori (odds ratio=0.72), similar to that found in Australia in 2013 which were lower for Aboriginal women compared to other ethnic groups (odds ratio=0.45). Missed opportunities for health services to detect and manage diabetes in pregnancy have ongoing health consequences for Māori women and their offspring.

Lower screening rates are unlikely to be due to selective screening of high-risk women, as Māori have a higher rate of diabetes in pregnancy, and experience poorer outcomes, compared with European women. In the current study, in one small regional hospital, the disparity in GDM screening results for Māori compared with non-Māori actually worsened over time. In 2017, the screening rate for Māori was 65%, but in 2020 it decreased to 58%, whereas the rate for non-Māori remained about the same (84% then 85%). Therefore, more targeted interventions are required to reduce inequities faced by Māori women. For example, access to antenatal care is a determinant of healthcare and Māori women on average utilise less antenatal services than other ethnic groups. Potential solutions to overcome this specific barrier could include working together with local iwi and providing marae-based antenatal care, to enable Māori women easier access to care as well as receiving more targeted and culturally appropriate care. This will also facilitate easier follow-up of test results and providing additional tests if required, hence helping to improve the discrepancy between the difference in proportion of Māori women screened using Standard 1 and Standards 2/3.

Similar incidence of screening in Pasifika women who are also at high risk of pre-existing diabetes and GDM (median 7.2% in New Zealand), as well as poor
pregnancy outcomes are also found in several studies. A systematic review of 49 observational studies conducted up to 2013, and including studies from New Zealand, identified both Māori and Pasifika women, as being at higher risk of having undiagnosed type 2 diabetes.

The audit reports in the current study suggested several root causes as contributing to rates of screening lower than the targets set. One cause was late booking with a lead maternity caregiver (LMC), which in one audit occurred in 83% of women. Most audits found that for some women, the GCT or OGTT was either completed earlier or later than 24–28 weeks’ gestation. Timing of the test is important because of the physiological metabolic changes that occur during pregnancy.

Other barriers identified in the audit reports include the distance it takes to get to the chosen setting for the screening test to be performed; the time and money that it may cost the woman to attend the appointment; poor patient awareness of the importance of screening; poor LMC awareness of the national guidelines; difficulty adding HbA1c to booking blood forms; the need to book the appointment before coming in; the appointment setting not being child-friendly; a lack of culturally appropriate venues; women who have had a low HbA1c already could be considered low risk, and so the health provider may be less likely to book a GCT; and discrepancies between national and local guidelines.

Possible solutions to overcome these barriers were also identified. Some reports included stakeholder engagement and they found out changes that had occurred in their local settings that may have contributed to improvement in screening and testing rates. For example, one urban centre introduced a change in the community Labtest protocol to include HbA1c as part of the package of “first antenatal booking bloods”, unless a woman opted out. An article was also published aimed at general practitioners about the importance of testing for undiagnosed diabetes in early pregnancy due to the benefits of early intervention to improve outcomes for pre-diabetes in pregnancy. The effect of these interventions was shown by an improvement in HbA1c screening within 20 weeks’ gestation in that site from 15% in 2015 to 93% in 2016.

Other interventions included patient reminders via mail/SMS/email/phone; easily accessible information pamphlets for pregnant women and women intending pregnancy; incorporating an HbA1c tick box onto the antenatal booking blood forms; fridge magnets with important dates during pregnancy distributed with initial booking visit; LMC or general practitioner education. Another recommendation was for a two-step approach, as opposed to the one-step process recommended by ADIPS and RANZCOG.

The evaluation of Standard 4 showed that many hospitals already met the standard of care. However, as there was no non-random variation shown during this time period, we posit that perhaps there was a previous well-known national awareness of the recommendation for OGTT testing after an abnormal GCT, likely due to the consistency of international guidelines with each other and over time.

Strengths of this study include individualised audits allowing the identification of differences between hospitals, and the use of run charts to assess the impact of health care interventions. Limitations include the absence of baseline data prior to the 2014 guideline, on which a baseline median could have been established; inability to perform run chart analyses for Standards 2 and 3 due to inadequate data points; variations in the standards (e.g., Standard 1 was based on the 2014 guideline, which recommended that HbA1c be completed with the first antenatal booking bloods; however, most audits reported when the test was completed, not whether completed with the booking bloods); women who were not enrolled with a midwife/hospital were not included; it is unknown whether screening was offered and declined; data gathered during 2020 may have been affected by the disruption to normal health services by COVID-19 restrictions.

In conclusion, whilst this review found that there is improving quality of care for screening of diabetes in pregnancy, further interventions and local policies are needed to improve adherence rates to all standards of care. Targeted interventions should be applied to Māori women who are shown to be under-screened at 24–28 weeks’ gestation. A formal analysis of barriers and enablers to implementing the GDM guideline in New Zealand, similar to that done in Queensland, would be helpful. Further research on implementation of national maternity guidelines is warranted.
COMPETING INTERESTS

Nil.

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URL


REFERENCES


### Appendix 1: Patients audited for each standard by year.

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*An audit conducted over 2017–2018 with sample size 120, included in sums for both 2017 and 2018.
†An audit conducted over 2019–2020 with sample size 150, included in sums for both 2019 and 2020.
*Both audit numbers were included only once in the total for each standard.