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RESEARCH ARTICLE

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Oral glucose tolerance test—The imperfect gold standard for gestational diabetes screening: A qualitative study involving clinicians in regional, rural and remote areas of Western Australia

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Abstract

Issue Addressed: The oral glucose tolerance test is the 'gold standard' for detecting gestational diabetes in Australian and International guidelines. Test completion in regional, rural and remote regions may be as low as 50%. We explored challenges and enablers for regional, rural and remote antenatal clinicians providing gestational diabetes screening to better understand low oral glucose tolerance test completion.

Methods: We conducted a qualitative descriptive study using semi-structured interviews. Participants eligible for the study were doctors or midwives providing antenatal care in regional, rural and remote Western Australia, between August 2019 and November 2020. Interviews were recorded digitally and transcribed into a Word document. We conducted a thematic analysis after initial categorisation and deduction of themes through workshops involving the research team.

Results: We found a diversity of viewpoints on oral glucose tolerance test reliability for detecting gestational diabetes. Themes that emerged were; good collaboration between antenatal clinicians is required for successful screening; screening occurs throughout pregnancy using various tests; clinicians make significant efforts to address barriers; clinicians prioritise therapeutic relationships.

Conclusions: Effective universal screening for gestational diabetes in regional, rural and remote Western Australia is difficult and more complex in practice than guidelines imply. Detecting gestational diabetes requires creative solutions, early identification of at risk women and trust and collaboration between clinicians and women.

So What? Detection of gestational diabetes in regional, rural and remote Western Australia remains poorly completed. New strategies are required to adequately identify women at risk of adverse birth outcomes relating to hyperglycaemia in pregnancy.

KEYWORDS
clinical decision making; gestational diabetes; obstetric clinicians; oral glucose tolerance test; regional, rural and remote; screening; women's health

1 | INTRODUCTION

Gestational diabetes mellitus (GDM) is one of the most common maternal complications of pregnancy and impacts on the health of mothers and babies through birthing complications and long term effects on glucose metabolism.[1] In Australia in 2021–2022, 17.9% of women giving birth were diagnosed with GDM and that figure was up to 20% higher for those in very remote areas compared to urban settings.[2] Treatment of GDM can have a positive impact on perinatal outcomes for mother and baby.[3,4] Having GDM also increases the long term risk of women and their offspring developing type 2 diabetes later in life.[5] Based on findings from the Hyperglycaemia and Adverse Pregnancy Outcomes (HAPO) study and subsequent recommendations from the International Association of Diabetes and Pregnancy Study Groups 2010 Consensus Panel, universal screening with the oral glucose tolerance test (OGTT) between 24 and 28 weeks gestation is considered the 'gold standard' for detecting GDM.[6,7] Universal screening for GDM with the OGTT at 24–28 weeks has been in most clinical guidelines in Australia for around a decade with early screening also recommended for women at high-risk.[8]

Reported rates of completion for the OGTT in universal screening range widely. Internationally reported rates include studies from regional Ghana 54%,[9] French Rhone Alpes region 59%,[10] the HAPO trial which included 15 centres across nine countries 89%[6] and Sweden with a modified OGTT in a selected cohort from five regional hospitals 93%.[11] In Australia, reported rates included one study of three hospitals in one health jurisdiction on the east coast 92.1%,[12] a prospective observational study in rural and remote Western Australia (WA) 85%,[13] and a retrospective audit across regional, rural and remote WA 50% (range 29%–73% per clinical site audited).[14] From this limited sample, the highest completion rates were in prospective studies and those in selected hospitals or well described health jurisdictions. The lowest completion rates were in retrospective audits of regional, rural and remote settings across multiple health centres.[14] No reports of direct comparisons of OGTT completion in urban and non-urban settings were found. Australian Institute of Health and Welfare data reported 160 000 Australian women had an OGTT in pregnancy in 2020.[15] There were a total of 294 000 births in the same period.[16] Allowing for pre-existing diabetes (1%), twin births (3%) and premature births before 32 weeks gestation (1.3%) these figures suggest that an OGTT is completed in less than 60% of all eligible pregnancies in Australia.[17,18]

Reasons for not completing the OGTT are not clear. In the WA audit of regional, rural and remote births, clinicians reported that patient and clinician factors and logistical challenges were the most likely reasons the OGTT was not completed.[14] These included refusing or being unable to drink the glucose load, leaving before the completion of the 2 h test, late pregnancy presentation for testing, clinicians using alternative tests to the OGTT, the challenge of long travel times to get tested in remote and rural areas, and poor communication between different health care providers caring for pregnant women.[14]

The OGTT is known to have low test–retest reliability in pregnant women, with 22%–24% of women with a positive result for GDM having a negative result 1–2 weeks later.[19,20] There are numerous factors that influence the result of the OGTT, including pre-test diet, time of fasting, glucose load, sample type, collection tube used, storage, transport of samples, patient hydration, activity levels before and during the test, stress and gastric emptying. Post-test variables include laboratory test bias, imprecision, reporting and interpretation of results and identification of critical results.[21] Taken together with the documented gaps in real life screening in regional, rural and remote communities, current screening for GDM risks missing or misdiagnosing GDM.

In response to this suboptimal screening for GDM in regional, rural and remote WA, the Optimisation of Rural Clinical and Haematological Indicators of Diabetes in pregnancy (ORCHID) study has been looking at GDM screening in these populations since 2014. Preanalytical factors confounding the accurate identification of GDM in regional, rural and remote women in WA have been documented.[13] Despite GDM testing guidelines, a wide range of other tests have been used instead of the OGTT.[14] In these settings local clinicians are critical to the decisions about which tests pregnant women are offered, when they are offered and in other ways influence uptake of the test. To better understand deviations from recommended screening guidelines this paper explores the challenges and enablers of GDM screening as perceived by regional, rural and remote clinicians providing antenatal care in WA.

2 | METHODS

2.1 | Setting

In WA, the regional, rural and remote population is approximately 590 000 (21.3% WA population) and concentrated in the southwest of the state.[22] Regional population details for study sites (Kimberley, Goldfields, Southwest) and the main models of antenatal care in regional, rural and remote WA are described in Tables 1 and 2, respectively. Antenatal care is provided through a variety of health services ranging from non-obstetric general practice (usually only in early pregnancy), obstetric general practice, midwifery care, small hospitals and regional hospitals.[23] Women are usually only referred to tertiary care if their pregnancy is complicated and requires more clinical care than is available in their rural or remote health service. For most regional, rural and remote women primary health care forms a key component

TABLE 1 Remoteness and population percentages of regions of Western Australia (WA) the participants worked in.[25]

	Kimberley	Goldfields	Southwest
Remoteness Modified Monash Model	6–7	3–7	2–5
Distance to tertiary hospital (range)	>1000 km	501–1000 km	100–500 km
Proportion of the WA population	1.3%	2.0%	11.5%
Regional Aboriginal population	41.1%	7.0%	2.8%

Note: Modified Monash Model key: MM1 = major cities, MM2 = regional centres, MM3 = large rural towns, MM4 = medium rural towns, MM5 = small rural towns, MM6 = remote communities, MM7 = very remote communities.

of their antenatal care as per WA Health Department recommendations.[24]

In the very remote Kimberley region, which includes large Aboriginal populations, most antenatal care is provided by midwives and General Practitioner Obstetricians (GPOs) based in Aboriginal Community Controlled Health Services (ACCHS) or WA Country Health Service (WACHS) clinics and hospitals. In the remote Goldfields region, while most of the models of care described in Table 2 are available, there is a strong reliance on WACHS with complimentary GPO support from general practice clinics. In the rural Southwest region, where there is a higher population density with smaller Aboriginal populations and closer proximity to tertiary services in Perth, all the models of care are available. Tertiary referral services are located in Perth, 170 to 3000 km away, depending on the region.

2.2 | Positionality

AK is a rural GPO with 18 years' experience in antenatal care, including a significant number of pregnant women diagnosed with GDM. He currently works as a director of a university department where three of the participants are/were employed part-time to teach medical students. He is completing a PhD on barriers and enablers of GDM screening in regional, rural and remote WA. ES is a Bardi-Jawi traditional owner, a mother of four, who experienced GDM with her third child, works for an ACCHS and a university. She joined the ORCHID Study in 2016 and is currently a project Co-Lead, based in a remote town. DA is a long-term academic GP who has worked extensively in Aboriginal health, Aboriginal health policy and guideline development for the remote Aboriginal health context. CS is a social scientist and health service researcher based in metropolitan Sydney, with 10 years' experience working in rural and regional settings, including with remote Aboriginal communities. JM is based in a remote town and has been conducting collaborative health services research, predominately with ACCHS, over the past 17 years. She led the development of the ORCHID Study. ES and JM regularly provide individual support and clinic level in-services to clinicians participating in the ORCHID Study, including to four participants.

2.3 | The present study and ethics

This study used a qualitative descriptive approach designed to describe the barriers and enablers for clinicians providing GDM screening using the OGTT.[30] Ethics approval for this study was obtained from the University of Western Australia's Human Research Ethics Committee (reference 2019/RA/4/20/5572).

2.4 | Participant eligibility

Interview candidates were eligible to participate in the study if they were currently practising antenatal care throughout pregnancy in a regional, rural or remote setting in WA and were registered as a doctor or midwife at the time of the study. Six of the eight interview participants were known to AK prior to interviewing them, primarily through professional connections while working as a GPO in regional, rural and remote WA. There were no prospective participants who refused to participate or dropped out.

2.5 | Data collection

Interview candidates were selected through purposive sampling across geographical regions, clinical backgrounds and models of care. To maintain participant anonymity limited information on the regions the participants worked in, and their clinical experience has been reported. Candidates were given written information about the study. They provided informed and free consent and completed a signed study consent form prior to interviewing. The interview questions were developed by AK and JM and reviewed and edited by CS (Supporting information S1). The questions were pilot tested on a colleague who was currently providing antenatal care. Semi-structured interviews were conducted by AK between August 2019 and November 2020. Interviews were conducted in the participants' workplace. There were no non-participants present at the interviews. Written notes including contextual information were made by the interviewer at the time of interview. Interviews were transcribed to word documents by a professional transcription service and uploaded into NVivo (NVivo 12, Denver, CO). For two participants follow-up interviews were conducted when we identified missing information in the first interview.

2.6 | Data analysis

Complete interview transcripts were shown to each participant for review prior to coding. One participant made written amendments to the

TABLE 2 Regional, rural and remote obstetric clinicians and care settings.

Obstetric clinicians/setting	Description
Midwife Group Practice	Midwife Group Practice models of care are part of a suite of midwifery continuity of care models available in Australia.[26] Midwives provide antenatal, intrapartum and postpartum care. Regional, rural and remote midwives work across primary and secondary care settings, seeing women at home visits, in clinics and in hospital wards.
General Practitioner Obstetrician (GPO)	GPOs in private practice see women for antenatal care in their rooms and care for women giving birth in the local hospital.[27] Postnatal care is briefly hospital based then reverts to primary clinic-based care. GPOs may provide care up to and including caesarean section if required. GPOs may also work as salaried staff in public hospitals.
Specialist obstetricians	Specialist obstetricians work across most regional, rural and remote regions in WA, providing in-hospital care, clinic care and outreach care.
Aboriginal Community Controlled Health Services (ACCHS)	ACCHS provide holistic and culturally appropriate primary health care to Aboriginal communities. GPOs working in ACCHS may only provide antenatal and postnatal care through the clinic or may also work in hospitals providing intrapartum care.
State government model of care	WA Country Health Service (WACHS) provides most of the hospital based care in non-urban regions of WA and primary health care clinics in some remote towns and communities.[28] Non-urban hospitals may provide primary and secondary levels care. Tertiary level public obstetric care is usually provided in Perth by King Edward Memorial Hospital.[24] Timing and coordination of transfer of care to Perth is a major issue for women from remote areas such as the Kimberley region.[29] Hospital based antenatal care occurs mostly after 20 weeks' gestation.
Private hospital care	Two private rural hospitals provide obstetric care in rural WA, one situated in the Southwest (Bunbury: Modified Monash Model (MMM) 2) and the other in the Mid-west (Geraldton: MMM3) regions.

transcript of their interview. We used a qualitative descriptive approach for thematic analysis.[31] Reviewed by Doyle et al. qualitative descriptive thematic analysis is a pragmatic approach used in healthcare research to describe the 'who, what and where of phenomena'.[31] The interview transcripts were analysed with initial descriptive coding by AK and JM and categorising and deducing themes generated in subsequent workshops that included most of the team (AK, JM, DA, ES). This was used as a strategy to diversify points of view, ensure inclusion of collective knowledge and expertise, and minimise bias from interviewer-participant relationships. Team discussion and review of the original interview data was used to resolve disputes and achieve consensus. Using an expanded definition of consent, participants were provided with a full draft of the paper for comment and asked about potential identification of participants. Five participants responded by email to the draft of the paper. Two participants requested identification numbers and participant gender be removed to preserve anonymity. There were no other requests for change.

3 | RESULTS

3.1 | Participants

We conducted interviews with eight clinicians (majority identified as female). Three interviews were conducted face to face, two by phone and three by videoconference. All interviews were digitally audio-recorded. The time taken to interview each participant was a mean of 28 min (range 19–39 min). The participants professional backgrounds included two midwives, four GPOs and two specialist obstetricians. The eight participants worked in varied health care settings and in some cases more than one town or community. All GPOs worked in either a general practice or an ACCHS delivering antenatal care. All GPOs also worked at the local hospital for births, some in private practice and others in the public health service (WACHS). One midwife worked entirely in an ACCHS and the other in a regional referral hospital and Midwife Group Practice. The two specialists were employed by WACHS and based at one of the hospitals in their region. In addition to working in WACHS antenatal clinics they consulted widely across their regions, providing advice to other antenatal health professionals in very remote areas. The mean number of years worked in obstetric care was 18 years (range 8–40).

3.2 | Thematic analysis

From the thematic analysis four themes emerged which are explored below: effective regional, rural and remote antenatal care relies on collaboration across organisations; screening for GDM occurs throughout pregnancy and clinicians use different approaches during early, mid and late pregnancy; clinicians go to significant lengths to manage barriers complicating OGTT completion; and clinicians prioritise maintaining good therapeutic relationships.

3.3 | Effective regional, rural and remote antenatal care relies on good collaboration across organisations

All participants stressed the importance of collaboration across organisations in providing the complete care each pregnant woman required. Collaborative arrangements varied according to clinical need,

physical infrastructure and clinician skill set. Within these collaborative arrangements, frequent and open communication was highlighted as a feature of good care. Several participants talked about regular shared-care meetings, which brought together clinicians from different clinical settings such as hospital based care, private clinics and ACCHS, and community based outreach.

> ...we have a weekly MDT [multidisciplinary team, midwives, doctors, allied health from clinic and from local hospital] meeting at the hospital where we can discuss any of our high-risk patients.
>
> GPO

> So although we've had a fairly heavy load of high-risk patients, we still are like talking most days to the birthing centre and the obstetricians and the community midwives as well.
>
> Midwife (based in antenatal clinic communicating with hospital and birthing centre based colleagues)

> We have a very well organised high-risk meeting every week what give us fantastic opportunity for collaborative care. Every provider of antenatal care is involved in the meeting [hospital doctor and midwives, GPOs from private GP clinic, midwives from local ACCHS].
>
> Obstetrician

The obstetricians were most likely to see women after 20 weeks gestation, which was commonly when GPOs and midwives referred women for specialist care if required. Assessment of risk and screening for GDM was likely to be organised by GPOs or midwives. In remote regions, where community-based care is often limited, clinics relied on obstetrician back up for advice and patient review.

> I quite often do phone consults, but it's mostly with the actual health professional rather than the patient to the smaller communities, which we have 108 of them [communities], supposedly – that we may give just advice on pregnancy care.
>
> Obstetrician (referring to consultations from the hospital with small very remote communities regarding locally residing antenatal patients)

One participant described the lack of understanding from a tertiary referral centre of the complexity of clinical care being managed by remote hospitals, highlighting the adverse consequences of not communicating well between different care providers

> So we made this consultation with [Tertiary Hospital], and they were blown away that [Town 1], [Town 2] and [Town 3] deliver Type 1 and Type 2 diabetics. ... they thought they had all the diabetics, so they thought that their diabetes database was complete, but we unfortunately told them it wasn't; that probably 20% of our patients are Type 2 diabetics.
>
> Obstetrician

3.4 | Screening for GDM occurs throughout pregnancy and clinicians use different approaches during early, mid and late pregnancy

Most participants reported that their usual screening for GDM included a risk profiling assessment in first trimester. All reported universal screening with the OGTT in second trimester between 24 and 28 weeks' gestation. Participants requested alternative tests when the OGTT was not completed or when GDM was not diagnosed but suspected clinically. Alternative tests to the OGTT included glycated haemoglobin, fasting glucose, four-point profile glucose and point of care glucose testing. In third trimester if GDM had not been diagnosed but was suspected, alternative ways of assessing risk included using serial ultrasound looking for foetal overgrowth, four-point profile glucose testing and occasionally an OGTT.

Clinicians modified their screening strategies according to the characteristics and specific risks of their antenatal populations. For example, some clinicians identified groups of women with strongly held beliefs about the harm of the sugar load of the OGTT. These clinicians modified their screening strategy to accommodate their patient's preferences.

> So if there's no clinical symptoms or findings that suggests things aren't normal, then their preference is to not go looking for things that are abnormal and certainly not to expose themselves and their fetus to unnecessary sugar load...
>
> GPO

Others worked with predominantly one cultural group, such as those working in ACCHS, and adopted risk assessment based on their predominant antenatal demographic. For some being part of the ORCHID Study affected their first trimester screening practice.

> [I] used to do more HbA1cs [glycated haemoglobin] but I've, I've gone more towards this testing [fasting blood glucose] because I just think it's probably a little bit more accurate.

> Being part of the ORCHID study (laughs) [made me do that]
>
> GPO

Some participants referred to 'offering' the OGTT and trying to do it, while others talked about 'sending' women to do the OGTT.

> most of our patients would probably fall into that high-risk category at [ACCHS] and would be offered an

> early OGTT… and then all our women are offered it generally at 28 weeks at [ACCHS], we try and do it
>
> GPO

> So those ones I just send for the 26 week oral glucose tolerance test.
>
> GPO

Several participants were interviewed around the time of COVID (SARS-Cov-2 virus) isolation restrictions (17 April—14 August 2020). New guidelines for GDM screening were introduced to reduce the risk of cross-infection in the clinic. Some participants reported strictly following the new guidelines. In addition, effort was made to calculate the numbers of possible GDM case being missed with the modified screening format.

> because we had the outbreak in [Town1] and [Town2] we very quickly moved over [to the new guidelines]. We had no OGTTs in the first trimester, we did the HbA1cs [glycated haemoglobin] in the first trimester, if we had concerns with the cut-offs, and then … we did a BSL [blood sugar level] on the ward before the patient went.
>
> Obstetrician

Others reported that while they continued with the OGTT they went to significant lengths to keep women safe by separating them from the general patient population attending the clinic. The driving concern reported in these cases was a missed diagnosis of GDM and that they would then have complications from untreated GDM.

> because we felt that our women are at such high-risk of having GDM that we still kept going with some of our [O]GTTs. Particularly in the women who had significant number of risk factors.
>
> GPO

> Because I was the only one doing them, I would just make sure there was only ever one coming in, and because the practice wasn't seeing many other patients, they had a separate waiting room section to sit in away from everybody else, because I still wanted to do them.
>
> GPO

> but stuff happens to our girls, that they do have significant shoulder dystocia and stuff, so – yeah, I just kept doing them.
>
> Midwife

A number of participants felt that the OGTT was inaccurate based on other clinical markers, either over diagnosing or underdiagnosing GDM.

> I feel, and I think many people seem to feel that there are a lot of women that are getting a positive result, so, 'You've got GDM', when clinically and the development of their baby and their management, and that sort of thing, and random sugars perhaps indicate that perhaps they're not GDM.
>
> Midwife

> Yep for sure both ways. I think some women that, that get a positive test, I think that really shouldn't have been positive and then I, there's women that get a negative test and you think 'Ooh gosh.' I was really expecting that to come back positive.
>
> GPO

> I also really like looking at the one- and two-hour difference these days because I think that these two-hour BSLs, you've got these patients with massive babies on board and their two-hour sugars are perfect, and then you go back to their OGTT and find it was their one-hour where they had the big rise.
>
> Obstetrician

> I think we have all seen people who have snuck under the barriers at 26 weeks, and they end up with a big baby and you retest their sugar later on and it is high. So there must be some false negatives.
>
> GPO

One participant, while recognising multiple factors can compromise the accuracy of the OGTT, said that in normal clinical practice they accepted the results as they were reported.

> I must admit I take them at face value, if they are up, they are up.
>
> GPO

3.5 | Clinicians go to significant lengths to manage the barriers complicating OGTT completion

Barriers to OGTT completion that participants most commonly identified were nausea and vomiting, patients' health beliefs, COVID variations and past bariatric surgery. Less commonly participants identified patients' difficulties with fasting, moving between towns during pregnancy, needle phobia, positive OGTT limiting birth options, being too busy to do the test, and presenting late in pregnancy for antenatal care. One participant highlighted the role of controlling partners interfering with patients completing the full 2 h test. The lengths taken by clinicians to ensure the OGTT was completed included prescribing anti-emetic medication to enable the pregnant women to keep the glucose load down, making the clinical environment as attractive as possible, creating separate clinic spaces to isolate pregnant women

completing the OGTT from other patients in the waiting room and minimising infection risk with COVID, facilitating the actual OGTT in the clinic (providing the glucose load and taking the blood tests), adding midwife led information sessions to the periods of waiting between the OGTT blood sample collection, providing online pregnancy education material including information on the OGTT, and welfare checks on women at risk of not attending or attending late. This contrasted with the more expected practice of simply providing a patient with a request form and expecting them to attend a pathology collection centre to get the test done.

> I give them [anti-emetic medication] before I give them the drink. Otherwise if they vomit it's such a shame; they undo all their good work from the fasting, tolerating that horrid drink that makes them nauseated it doesn't take much to give them [anti-emetic medication] to get them through the test.
>
> GPO

> The patients like it because they get free Wi-Fi, they don't have to sit in a pathology collection place, like, it's a nice, pleasant environment, so I think that increases our [O]GTT rate. And we include a midwife visit when they come in for their [O]GTT to try and make it a little bit more worthwhile.
>
> GPO

The descriptions of the oral glucose load by participants were graphic, suggesting a strongly visceral response to the discomfort of women trying to drink it.

> it's still slimy and some people – oh, my goodness, some people just choke it back, they can – they can't even bear to smell it.
>
> Midwife

For one participant this led to a search for alternatives to the standard glucose load such as a rice meal. This clinician reported spending considerable time searching the literature for alternative methods of providing a glucose load, due to their experience with managing nausea and vomiting during the OGTT.

> I see that the Asian countries have used rice, and we even came up with a basic protocol… Because I think the vomiting is a big issue, and I would love to see whether you'd get alternatives to the liquid. Something that's more tolerable, and I see that other countries have done that.
>
> Obstetrician

For some participants, the barriers were psychological and included the stress of a diagnosis of diabetes, the restriction of birthing options like home births or conflicting health beliefs, which led women to feel the test itself was potentially harmful. Due to these unintended consequences from the OGTT they prioritised time to find alternatives for these women.

> they know that if they have got GDM they can't have a homebirth… There is a perception that all their options will be taken away the moment they become gestational diabetic.
>
> GPO

> So giving a big dose of sugar I guess, they kind of see that as a potentially harmful thing to do to the baby.
>
> GPO

3.6 | Clinicians prioritise maintaining good therapeutic relationships

Most participants mentioned the importance of good communication between pregnant women and their clinician. Some highlighted the importance of trusted relationships. Opportunities for health education were sought in and around every antenatal visit. This included innovations such as providing educational sessions during the 2-h OGTT or links to purpose-built webpages on pregnancy wellbeing. For some clinicians the risk of a broken therapeutic relationship was the women receiving no antenatal care at all, in particular for those coming from remote communities which required a significant effort just to get to a routine antenatal visit.

> So, if you're well known to [ACCHS] and you've been coming in, you feel safe, a lot of women know me, they don't—they just ring me and say that they need a test. They—yeah, they can come in early.
>
> Midwife

The challenges of testing for and managing diabetes were identified as a barrier to some women returning for care. In this situation, the clinician focused less on the completion of tests and strict adherence to management regimens and more on building rapport and trust. In some cases, that meant foregoing OGTT completion.

> If I start to give her lesson that she needs to do this and this, then she never come again back and she will just come in labour, and we will do not know baby condition or her condition. This is not good, it doesn't work, trust me. What I find [is that] it [works much better] to have [a] good connection and the people coming to antenatal clinic. Obstetrician
>
> (referring to women coming from remote clinics)

In response to a question about what an ideal GDM screening test might look like participants identified fasting, nausea and vomiting, length of time to complete the test and flexibility around the timing of gestation to complete the test as key issues to be addressed.

because it would be great if it was point of care, that it was accessible to all so it could be done immediately with a good response, and it had a very, very high accuracy in regards to diagnosis, would be ideal.

Midwife (comparing GDM screening with current screening for type 2 diabetes in remote communities)

That would be my ideal; non-fasted, random, repeatable.

GPO

I think it would be fine for us to have to ask somebody to fast for the test, but if we could do away with that horrid drink and the two and half hour window that people really have to allocate, that would be my ideal test.

GPO

It would be, I think, more tolerable if there was a test that didn't have to have fasting. I think that would be definitely—and I think a quicker test would be good as well.

Obstetrician

4 | DISCUSSION

This paper highlights the experience of regional, rural and remote clinicians screening for GDM with the OGTT. The low rates of GDM screening in rural WA may be the consequence of the multiple challenges clinicians described from their clinical experience. The participants provided a level of detail not seen in other qualitative studies on GDM screening[32–36] and brings greater insight to the experience of clinicians using the OGTT in regional, rural and remote regions. Consistent with other research, our study identified a range of issues with current screening guidelines, including intrinsic challenges relating to the OGTT, factors that prevented women from completing the test, and systemic challenges of shared care arrangements in regional, rural and remote settings.[32–36]

To help counter these issues, participants emphasised the importance of strengthening relationships through good communication. They talked about prioritising building rapport and trust with women over completing the OGTT. In another study involving Aboriginal women living in remote WA, familiarity with the carer, use of appropriate language and demonstrating cultural awareness were key to good antenatal care.[29] Good communication was also seen to enhance the coordination of care across multiple facilities such as between primary care clinics and hospitals. Effective communication is a fundamental clinical skill.[37] In a rural or remote setting where obstetric care is shared across primary, secondary and tertiary care, and may be delivered across geographically separated locations, effective communication is even more critical. Elements of effective communication that participants talked about included both providing and receiving information, shared decision making, responding to emotions and facilitating effective behavioural change.[37]

The barriers to OGTT completion most reported by participants were nausea and vomiting, and women's health beliefs deterring them from doing an OGTT. As reported elsewhere clinicians in our study also reported patients' difficulty fasting, clinicians choosing alternatives to the OGTT and systemic difficulties like late presentation for care and limited access to services.[1,32] Additional barriers identified in this study included the negative influence of controlling partners and the loss of birthing options such as home birth following a diagnosis of GDM. Emerging barriers included the rise in number of women who had bariatric surgery unable to complete an OGTT, and infection control risk as highlighted during recent COVID lockdowns, both of which have been previously reported.[38,39] The complexity and adverse effects of the OGTT were believed in some cases to compromise the overall care of some women. As recommended by current guidelines, women with risk factors for GDM were likely to be asked to complete more than one OGTT.[40] This can become a deterrent for attending antenatal care as reported in one case study.[29]

In this study most of the participants, while acknowledging the place of the OGTT in early pregnancy and mid trimester screening, also identified a variety of other investigations they used. This is consistent with previous data which showed that in regional, rural and remote populations where OGTT screening was low the use of alternative tests was high.[14] Some participants used alternative tests when women could not complete the OGTT. Others used alternative tests to review and challenge the OGTT result which did not accord with their clinical expectations. This behaviour fits with the dual-process theory of diagnostic reasoning.[41] Dual-process theory argues that there are two systems of decision making, System 1 being intuitive, fast and involving pattern recognition. System 2 is slower, systematic, resource heavy and analytical.[41] Both systems have their roles and respective strengths and weaknesses. Uncritical acceptance of an OGTT result is consistent with a System 1 approach. Challenging the OGTT result when it does not match other clinical information is an example of System 2 thinking. The degree to which participants in this study questioned the validity of the OGTT and alternative tests were used to either replace the OGTT or interrogate the result undermines the value of this test in screening and as a basis for effective health promotion.

Several participants in this study expressed concern about the accuracy of the OGTT in identifying GDM, both under and over diagnosing women, referring to other clinical markers of GDM which did not align with the OGTT result. These observations from real world clinical settings may be attributable in part to the assignment of a dichotomous diagnostic cut-point for GDM to continuously variable data. In the HAPO study all primary and secondary outcomes, except for neonatal hypoglycaemia, showed a linear increase of adverse outcomes with rising hyperglycaemia, with no evidence of a natural threshold.[6]

The findings of this study justify a more detailed assessment of OGTT as an effective universal screening tool. If nearly half of the target population are not screened as recommended, then a better

approach to screening is needed. It may require a different screening test which is more acceptable to patients and more easily used in all settings, in particular regional, rural and remote settings. Better screening will enable more effective management of GDM. Better identification of patients at risk of adverse birth outcomes relating to hyperglycaemia in pregnancy will allow more effective health promotion around GDM risk and management.

This study had several limitations. We interviewed a relatively small number of participants. This study was part of a broader study (the ORCHID Study), and this likely influenced participant responses. Prior contact with ORCHID meant that participants were more likely to be thinking about the OGTT, barriers to its completion and how to address these barriers. As described above they questioned negative OGTT results if their clinical assessment suggested the patient was at a high risk of GDM based on risk profiling and other clinical results such as serial growth scans. The interaction of some study participants with the broader ORCHID Study prior to being interviewed created a specific context for this study. The findings of this study may not have relevance to the wider antenatal workforce. Of note a follow up quantitative study aiming to recruit a larger, more representative sample of the antenatal workforce in rural, regional and remote WA is currently underway using a factorial survey design.

The absence of clinicians who identify as Aboriginal and/or Torres Strait Islander is a limitation of this study. Australian Aboriginal and Torres Strait Islander peoples comprised only 1.4% of all medical practitioners and across all Australian health professions Aboriginal and/or Torres Strait Islander peoples are employed at a third of the rate of non-Indigenous Australians.[42] The small numbers of rural based Aboriginal or Torres Strait Islander obstetric doctors and midwives made it difficult to recruit for this study. However, it remains important to include in studies such as this given the higher proportion of Aboriginal and/or Torres Strait Islander peoples in rural and remote populations.

Other study limitations included the absence of the patients' voice and potential bias created by relationships between the authors and study participants. A further study focussing on the patients' perspective is planned. With regards to bias arising from relationships between the researchers and participants, AK worked with or knew professionally six of the participants prior to the study. For three participants there were unequal power relationships with AK given reporting lines within the university department they worked in. Similar prior relationships existed between DA and two participants. The engagement of the ORCHID Study across all three regions meant there were also pre-existing relationships between JM and ES and several participants. We used several strategies including debriefing techniques[43] to promote reflexivity and minimise bias. We included in our study team one member (CS) not connected to the study participants through prior association and not familiar with the clinical details of GDM screening to bring an outside view to the study design and execution. We used triangulation through comparison of this study with data from a similar clinical setting but different time point.[14] To ensure the transcription and meaning of participant comments was accurately captured we provided participants with a copy of their interview transcript. Further debriefing included providing this paper to participants and an external stakeholder (a senior Aboriginal clinician who provides strategic leadership to ACCHS, including Aboriginal health policy and planning) prior to submission.

By contrast the relationships between the authors and the participants facilitated recruitment across three geographical regions and from a diversity of professional backgrounds. A strength of the interviews was the richness of data yielded by the clinicians on the challenges and enablers of screening for GDM with the OGTT in their regional, rural and remote environments.

5 | CONCLUSION

This study suggests that part of the challenge of screening for GDM with the OGTT has been the difficulty clinicians have, using this test in regional, rural and remote populations. Effective screening for GDM requires creative solutions that address the current challenges using the OGTT as a screening tool. That may require different ways of promoting and applying the test. It may require a different test being used. Finally, trust and collaboration between clinicians, health services and women are critical for the coordinated screening and management of GDM in the time limited window of pregnancy. Failure to address these contextual issues significantly impairs the success of screening for this important health issue.

AUTHOR CONTRIBUTIONS

Andrew Kirke: Conceptualisation; methodology; formal analysis; investigation; data curation; writing—original draft; writing—review & editing; project administration. **Erica Spry:** Formal analysis; writing—review & editing; **David Atkinson:** Formal analysis; writing—review & editing; supervision. **Craig Sinclair:** Writing—review & editing, supervision. **Julia Marley:** Conceptualisation; methodology; formal analysis; writing—review & editing; supervision.

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CONFLICT OF INTEREST STATEMENT

The authors declare no conflicts of interest.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are available on request from the corresponding author. The data are not publicly available due to privacy or ethical restrictions.

ETHICS STATEMENT

This study forms part of a broader research project aimed at improving screening for and management of hyperglycaemia in pregnancy (ORCHID Study). Ethics approval for this sub-study was obtained from the University of Western Australia's Human Research Ethics Committee on the 28th of August 2019 (reference 2019/RA/4/20/5572). All participants in the study provided written consent.

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SUPPORTING INFORMATION

Additional supporting information can be found online in the Supporting Information section at the end of this article.

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