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Improving glycaemic control in primary care for Tongan adults with type 2 diabetes through the use of continuous glucose monitoring and holistic support: a pilot study

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ABSTRACT

Introduction. In Aotearoa New Zealand, Pacific peoples, including Tongans, experience disproportionately higher rates of type 2 diabetes and related complications. There is an urgent need for innovative, culturally appropriate interventions to improve outcomes. **Aim.** This study aimed to determine the impact of continuous glucose monitoring devices with cultural wrap-around support on medium-term glycaemic control and other type 2 diabetes biomarkers in Tongan adults with high-risk type 2 diabetes. **Methods.** Twenty-two Tongan adults with HbA1c ≥60 mmol/mol were invited to participate in a 6-month pilot intervention study involving 4 weeks of continuous glucose monitoring wear at baseline and 2 weeks at 3-months, alongside wrap-around care delivered by a Tongan kaiāwhina (support health worker). The primary endpoint was 3-month HbA1c. Clinical (glycated haemoglobin, lipids, estimated glomerular filtration rate, urinary albumin to creatinine ratio) and psychosocial (Diabetes Self-Management Questionnaire, measured at baseline and 3 months) outcomes were measured at baseline, 3, and 6 months. **Results.** Nineteen participants completed the study through to 6 months. Mean HbA1c significantly decreased from 80.2 ± 19.4 mmol/mol at baseline to 68.6 ± 14.2 mmol/mol at 3 months, with reductions maintained at 6 months. No significant changes in lipids or renal function were observed. Diabetes Self-Management Questionnaire scores increased from 4.9 ± 0.8 to 6.0 ± 1.0 (P < 0.001). **Discussion.** Culturally tailored continuous glucose monitoring-based interventions have the potential to support Tongan adults with understanding, optimising, and managing type 2 diabetes.

Keywords: continuous glucose monitoring, culturally responsive care, diabetes intervention, Pacific peoples, primary care, self-management, Tongan health, type 2 diabetes.

Introduction

In Aotearoa New Zealand (NZ), type 2 diabetes (T2D) disproportionately affects Māori and Pacific peoples.[1] However, research and public health discourse frequently treat Pacific peoples as a homogenous group,[2] overlooking distinct cultural beliefs and varying diabetes risks of different Pacific Island groups. Tongan people, in particular, experience higher prevalence, related complications, and premature death relative to other Pacific groups.[1,3] Tongan health beliefs emphasise holistic and community-centred wellbeing, but health services often struggle to incorporate these cultural values into care models.[4] This misalignment often contributes to poor engagement, reduced medication adherence, and delayed treatment of complications.[5]

Continuous glucose monitors (CGM) have demonstrated value as behavioural tools supporting self-management of T2D.[6] However, many CGM studies often involve people who are relatively well-educated within a Eurocentric model of care and have only moderately elevated HbA1c levels.[7] These populations may not reflect the lived realities

WHAT GAP THIS FILLS

What is already known: Pacific peoples with type 2 diabetes in Aotearoa New Zealand are often grouped together in research, despite being culturally distinct. They experience systemic health disparities and have higher-risk glycaemia than other ethnic groups. Although culturally adapted care approaches work well, they are not widely implemented.

What this study adds: This study shows the medium-term clinical improvements associated with continuous glucose monitoring and a Tongan-led support model, highlighting a promising pathway for addressing diabetes disparities in this population.

of more disadvantaged or underrepresented groups, including Tongan adults with T2D in NZ.

Recent CGM-based holistic care models have shown promising outcomes in improving T2D biomarkers and self-management behaviours among Māori through culturally grounded support.[8] Despite this, evidence on CGM use within Tongan populations remains limited. In Pacific communities, culturally-informed wrap-around care – including relationality, family support, and spiritual wellbeing – is essential for improving T2D self-management and outcomes. Therefore, this study aimed to assess the use of CGMs embedded within holistically grounded, primary-care-based wrap-around support to improve markers of diabetes management and associated risks of complications.

Methods

Study design and setting

This was a 6-month single-arm pilot study conducted with recruitment across multiple general practice clinics in the Waikato region of NZ. The design utilised an evolved Talanoa framework that integrates clinical support with traditional relational methodology.[8] Recruitment and participant engagement emphasised vā (relational space) through face-to-face dialogue within familiar community and church spaces.

To support wrap-around care, a Pacific health kaiāwhina assisted participants to source non-clinical needs such as housing or childcare when required. This ensured interactions were reciprocal and culturally safe rather than purely transactional.

Participants

Adults (aged ≥18 years) of Tongan ethnicity with T2D diagnosed ≥12 months prior and baseline HbA1c ≥60 mmol/mol were invited to participate. Participants were identified by GP practice clinical teams and approached through culturally appropriate processes, including introductions by Tongan kaiāwhina and trusted community connectors with existing relationships with families.

Intervention

The intervention combined CGM use with Tongan kaiāwhina-led education and relational support at weeks 1–4 and 12–13. This approach draws on Tongan health concepts including vā (relational space), talanoa (relational dialogue), and tokoni (reciprocal support).

Prior to study commencement, participants attended a face-to-face talanoa session to establish rapport and introduce the study. After informed consent, CGM wear was provided for weeks 1–4. Education was provided on the impact of macronutrients and physical activity on glucose levels. Participants logged food intake, activity, and medication using a diary or CGM application.

A medication review with the participant's GP occurred in weeks 2–4, with medications initiated or adjusted as required. When requested, kaiāwhina accompanied participants to clinical visits to assist with translation and clarify medical terminology and/or treatment changes. During week 2, CGM glucose trends were reviewed with participants, and lifestyle adjustments were discussed.

At week 12, a third CGM was applied and participants resumed educational support. A final visit occurred during weeks 13–14 to review CGM trends, consolidate learning, and support long-term management. During CGM wear, participants were contacted every 2–3 days either by phone or in person to support data interpretation, reinforce learning, and troubleshoot issues.

Data collection

Clinical outcomes were assessed at baseline, 12 ± 2, and 24 ± 2 weeks. Venous blood samples were analysed by the local laboratory service to measure HbA1c, lipid profile, creatinine, and estimated glomerular filtration rate (eGFR). Psychometric outcomes were collected using the Diabetes Self-Management Questionnaire (DSMQ) at baseline and 12 weeks. The DSMQ is a validated 16-item instrument measuring self-care activities related to glucose management, dietary control, physical activity, and healthcare use.[9] Scores are converted into a 0–10 scale, with higher scores reflecting more effective self-management behaviours. Medical history and medication use, including SGLT2i, GLP1RA, insulin, and other oral glucose-lowering therapies, were also recorded throughout the study. Clinical data were de-identified and stored in a password-protected database accessible to the research and clinical team. CGM data were uploaded to a cloud-based system accessible to the clinical care team to support ongoing monitoring and clinical decision-making.

Statistical analysis

Descriptive statistics (mean ± s.d.) were calculated for all clinical variables. Paired *t*-tests were used to compare outcomes between timepoints, and chi-square tests were used for categorical data (eg medication use/initiation). Analyses were conducted for the full patient cohort and stratified by baseline HbA1c (60–79 mmol/mol and >80 mmol/mol). Statistical significance was set at $P < 0.05$ and adjusted for multiple comparisons using Bonferroni correction for the number of tests at each time point. Analyses were conducted in R (R Core Team 2025).[10] Missing data were handled using pairwise deletion (available-case analysis), whereby participants were included in analyses when valid data were available for relevant time points. Variations in sample size across clinical biomarkers due to incomplete laboratory testing or participant availability are detailed in the Supplementary Table S1 footnotes.

Ethics

This study received ethics approval from Waikato University Human Ethics committee (HREC(Health)2022#01).

Results

Overall, 103 individuals were screened for eligibility. Of these, 81 were excluded prior to enrolment, mostly due to an inability to establish contact following initial screening ($n = 43$). Additional exclusions occurred due to failure to meet inclusion criteria ($n = 32$): diagnosis less than 1 year ($n = 11$), pregnancy ($n = 2$), or significant co-morbidities ($n = 19$). Six individuals declined participation. Twenty-two participants enrolled and commenced the study, of whom 19 completed the full 6-month follow-up. At baseline, the mean participant age was 50.5 ± 13.1 years, and mean T2D duration was 8.1 ± 3.2 years. Co-morbidities at baseline included hypertension ($n = 6$), obesity ($n = 5$), gout ($n = 4$), smoking ($n = 5$), depression ($n = 2$), chronic hepatitis B ($n = 1$), sleep apnoea ($n = 2$), osteoarthritis ($n = 1$), psoriatic arthropathy ($n = 1$), and albuminuria ($n = 1$).

The mean HbA1c decreased significantly from 80.2 ± 19.4 mmol/mol at baseline to 68.6 ± 14.2 mmol/mol at 3 months ($P = 0.001$) and remained significantly lower at 6 months (68.4 ± 15.7 mmol/mol; $P = 0.009$) (Table S1). Stratified analyses showed significant reductions in HbA1c at both 3 months $P = 0.004$) and 6 months ($P = 0.022$) among participants with baseline HbA1c > 80 mmol/mol. Overall, SGLT2i/GLP1RA use increased from 26% at baseline (5/19 participants) to 53% at 3 months (10/19 participants) and remained 58% at 6 months. Usage reached 100% at 3 months for those with baseline HbA1c > 80 mmol/mol, but only 18% in those with a baseline HbA1c 60–79 mmol/mol (not significant after adjusting for multiple comparisons). Insulin use remained unchanged across timepoints (Supplementary Table S1). Effect sizes and median change in clinical biomarkers are given in Supplementary Table S2.

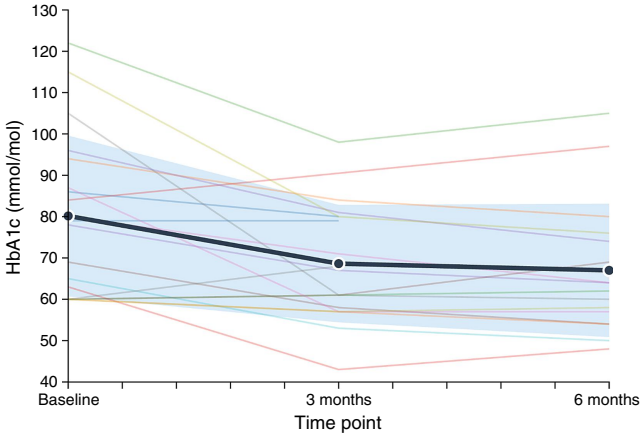

Fig. 1. Individual participant and overall mean (solid black line; ±95% confidence interval) change in HbA1c at baseline, 3, and 6 months.

Individual HbA1c responses varied (Fig. 1). Five participants (26.3%) experienced an increase in HbA1c from baseline (mean increase 7.2 ± 10.9 mmol/mol), four of whom were in the 60–79 mmol/mol group. Conversely, 13 participants showed reductions in HbA1c, including four with reductions ≥20 mmol/mol (mean reduction 23 ± 12 mmol/mol). SGLT2i/GLP1RA use was initiated in 6 of the 19 participants.

No statistically significant changes were observed for the other clinical biomarkers, including cholesterol, creatinine, or urine albumin–creatinine ratio (UACR). However, DSMQ scores improved significantly from 4.9 ± 0.8 at baseline to 6 ± 1.0 at 3 months ($P < 0.001$), with seven participants scoring above six, indicating optimal glycaemia control and healthcare utilisation.

Discussion

This study suggests that integrating CGM with culturally aligned primary care support may improve T2D outcomes in Tongan communities. This aligns with evidence from earlier studies that culturally-informed use of CGM in primary care can support Maori[8] and Aboriginal and Torres Strait Islander populations[11] to overcome barriers to diabetes management.

Although CGM technology enabled real-time learning and self-management, the culturally grounded wrap-around model guided by Tongan respect-based values[12] likely contributed to improved trust, access, and sustained engagement. Although this study was not designed to isolate the effects of individual intervention components, several factors may have contributed to the observed improvements.

These include the delivery of care within participants' homes, removal of financial barriers to consultations, and the development of long-term trust-based relationships between participants and healthcare providers. Future research should examine the scalability of this model across other Pacific communities and explore strategies to optimise medication prescribing and adherence within this framework. In particular, SGLT2i/GLP1RA use remained low in Tongan participants with HbA1c levels of 60–79 mmol/mol despite being eligible for funded access to these medications.[13]

A key finding of this study was the role of the CGM sensors as educational and behavioural tools. Unlike traditional finger-prick testing, CGM provides continuous visual feedback on glucose fluctuations. When combined with the Talanoa framework, this enabled kaiāwhina to facilitate culturally grounded conversations about diet and activity. The increase in DSMQ scores suggests that CGM supported participants to develop greater agency in diabetes management, shifting engagement from passive monitoring to active self-management. These findings resonate with the Mana Tū program, which emphasises the importance of relational support and wrap-around care in improving outcomes for Indigenous patients with T2D.[14]

Several limitations should be acknowledged. As a single-arm pilot study with a small sample size (n = 19), the findings may not be generalisable to broader Pacific populations. The absence of a control group also limits the ability to exclude external influencing factors or potential Hawthorne effects. Medication intensification occurred during the study, with SGLT2i/GLP1RA use increasing from 26 to 58%, making it difficult to isolate the effects of the CGM alone. However, the study aimed to evaluate a holistic approach integrating both pharmacological and technological approaches. The high retention rate suggests that the Tongan-centred recruitment and support model, grounded in relational trust (vā), was effective in maintaining engagement.

Conclusion

These findings highlight an innovative, scalable approach to delivering equitable and culturally safe diabetes care, with the potential to inform service design for Pacific communities across NZ.

Supplementary material

Supplementary material can be accessed from the article page online.

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Data availability. The data underlying this study contain identifiable health information and cannot be shared publicly due to ethical and privacy restrictions. De-identified data may be made available upon reasonable request to the corresponding author and with approval from the University of Waikato Human Research Ethics Committee (HREC(Health)2022#01). The findings and data presented in this manuscript will be incorporated into the PhD Thesis of Janina Galewski-Tangataevaha. The full thesis is not yet available as it is currently in preparation.

Conflicts of interest. The authors declare no conflict of interest.

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