

Illness perceptions and diabetes self-care behaviours in Māori and New Zealand Europeans with type 2 diabetes mellitus: a cross-sectional study

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ABSTRACT

AIMS: This study investigated differences in illness perceptions and self-care behaviours between Māori and New Zealand (NZ) Europeans with type 2 diabetes mellitus (T2DM), and how these perceptions were related to clinical outcomes.

METHODS: Participants were 85 Māori and 85 NZ European adults, recruited from outpatient clinics, who completed a cross-sectional questionnaire on illness perceptions and self-care behaviours. Clinical data, including HbA1c, retinopathy, neuropathy and nephropathy, were collected from medical records.

RESULTS: Compared to NZ Europeans, Māori had higher HbA1c, lower adherence to medication and a healthy diet, and were more likely to smoke. Māori reported greater perceived consequences of diabetes on their lives, and more severe symptoms than NZ Europeans did. Māori were more likely to attribute T2DM to food and drink, whereas NZ Europeans were more likely to attribute T2DM to weight. Perceiving that treatment could help control diabetes was associated with lower HbA1c and higher medication adherence in Māori and NZ Europeans independently.

CONCLUSIONS: Māori experienced and perceived worse T2DM outcomes than NZ Europeans did. Research is needed to develop and test clinical interventions to address these inequities and improve outcomes, possibly by asking patients about their perceptions, providing tailored and culturally appropriate education, and discussing patients' concerns.

In Aotearoa New Zealand, the prevalence of diabetes mellitus in adults aged over 15 years is 5.5%.¹ Prevalence is less than 3% in adults younger than 45, but over 12% in those 65 years or older.¹ Importantly, Māori, the Indigenous people of New Zealand are 1.8 times more likely to have diabetes than non-Maori, and are more likely to experience co-morbidities and lower glycaemic control.^{1,2} Epidemiological studies have demonstrated similar disparities in T2DM among many Indigenous populations worldwide.³ Indigenous peoples also have higher rates of cardiometabolic risk factors, including smoking, obesity and hypertension⁴. A shared history of colonisation has contributed to these disparities, by undermining culture and language, with intergenerational effects on health, family relationships, and relationships to land.⁴

Diabetes management targets for Indigenous populations should be similar to those for the general population, and to achieve these targets health services need to be made more relevant to social and cultural contexts.⁴ Environmental and social factors have been recognised as con-

tributing to health outcomes, and there are calls to address social and economic inequalities in vulnerable and deprived populations in New Zealand.⁵ Experiences of racism can also contribute to worse healthcare experiences, lower healthcare utilisation, and worse physical and mental health in New Zealand across a range of ethnic groups, with experiences of racism highest among Māori, Pasifika and Asian populations.⁶ Eliciting and addressing patients' social and cultural factors allows patients' perspectives to be heard, and creates opportunities for management approaches to be more patient-centred.⁴ Building mutual understanding can contribute to a stronger therapeutic relationship and facilitate engagement with self-care behaviours.⁴

Leventhal's Common Sense Model emphasises the importance of eliciting patients' perceptions and tailoring educational approaches to improve patient outcomes.⁷ Patients are seen as active problem solvers who perceive illness in several domains: identity (name and symptoms of the illness); consequences (effects on their lives); timeline (how long the illness will continue); personal

control (how much they can control the illness); treatment control (how much treatment can control their illness); causes (what caused the illness); and emotional responses (how the illness affects them emotionally). Research using this model has demonstrated associations between patients' perceptions of diabetes, self-care behaviours, glycaemic control, and diabetes-related complications.^{8–13} Furthermore, interventions to change illness perceptions have shown promise in improving perceptions and blood glucose control in patients with type 2 diabetes.¹⁴ Such interventions may be useful to improve health outcomes in a New Zealand context. However, most of this research has been conducted with European samples, and therefore may not be generalisable to other ethnic groups. There is a paucity of research on illness perceptions in ethnically diverse samples with T2DM.^{15–18}

Diabetes research in New Zealand has shown some cultural differences in illness perceptions. In 2004, Tongan patients held more acute and cyclical timeline perceptions than NZ Europeans did, and many Tongans believed that their T2DM could be healed by a “powerful other”; Tongans also had lower treatment adherence.¹⁰ In 2007, Pasifika peoples reported more symptoms (higher identity perceptions), more consequences, and higher diabetes-related distress than did NZ Europeans and South Asians.¹⁸ In addition, Pasifika peoples and South Asians reported significantly poorer self-care behaviours and medication adherence compared to NZ Europeans.¹⁸ Among both NZ Europeans and Pasifika peoples, greater perceptions of personal control and lower concern about diabetes were associated with lower HbA1c, and there were inconsistent associations between illness perceptions and self-care behaviours.

To date, no research has specifically examined illness perceptions with Māori who have T2DM, and only limited research has examined illness perceptions among Māori with other conditions. In 2011, differences were found in the way Māori perceived gout, with greater perceived consequences, concern and emotional responses, compared to NZ Europeans and other ethnicities.¹⁹ In work from 2007, Māori believed their schizophrenia would continue for significantly less time than NZ Europeans did.²⁰

The main aims of this study were to examine differences in illness perceptions between Māori and NZ Europeans with T2DM, and how perceptions related to self-care behaviours and clinical outcomes. Based on the documented poorer

health outcomes among Māori patients with T2DM and the past research, it was hypothesised that NZ Europeans would perceive less consequences, a longer timeline, lower identity perceptions and be less emotionally affected by T2DM than Māori. We also hypothesised that greater personal control perceptions and lower concern would be related to lower HbA1c in both groups, and that higher treatment control perceptions would be linked to higher adherence.

Methods

Participants and procedure

Approval to undertake this study was granted from the Auckland Health Research Ethics Committee, the Auckland District Health Board Research Review Committee and the Waitematā and Auckland District Health Boards Māori Research Committee.

A cross-sectional study design was employed. Outpatients were included if they identified as Māori or NZ European; were over the age of 16 years; spoke, read and wrote in fluent English; and had a confirmed diagnosis of T2DM. Participants were recruited at the Auckland Diabetes Centre clinic waiting rooms from 17 April 2018 to 29 August 2018. Approximately 32% of the clinic population were NZ European, and 13% were Māori. A consecutive sampling method was utilised whereby each patient who met the inclusion criteria was invited to take part in the study until the final sample size for each ethnic group was reached. When the sample size for NZ Europeans was reached, only Māori outpatients were invited to participate until the final sample size was reached.

Two hundred and three outpatients were assessed for eligibility; two outpatients were excluded as they did not speak fluent English (ethnicity not recorded) and 12 outpatients declined to participate (four Māori and eight NZ European). Of the 189 outpatients who agreed to participate, 14 did not return the questionnaire and five withdrew from the study, which constituted a 90% response rate. The final sample of 170 outpatients consisted of 85 Māori and 85 NZ European outpatients. Once written informed consent was obtained, participants could either complete the questionnaire while waiting for their appointment or take it away with them to return via pre-paid post. If the questionnaire was not received within three weeks, the participant was contacted to ask if they were still interested in participating.

If yes, they were mailed another questionnaire with a prepaid postage envelope.

Power analysis. G*Power 3.1 was used to determine the sample size.²¹ The study was expected to find effect sizes similar to Bean and colleagues (who found differences between Pasifika and NZ Europeans in identity, consequences, and emotional responses of $d = 0.6, 0.4,$ and 0.8 respectively, and correlations between illness perceptions and self-care behaviours between 0.26 to 0.68).¹⁸ To detect a correlation of 0.3 between illness perceptions, self-care behaviours, and blood glucose control, at power of 0.8 and a significance level of 0.05 , it required 85 participants. Eighty-five Māori and 85 NZ European were recruited so that correlations could be examined in each ethnic group separately. This sample size allowed the detection of differences between groups with effect sizes of Cohen's $d=0.43$ or greater.

Survey tools

Illness perceptions. The Brief Illness Perception Questionnaire (BIPQ) has been used to assess illness perceptions in many conditions and the psychometric properties have been demonstrated in studies with patients with T2DM.^{8,22} The BIPQ measures nine domains using nine single items: identity (“how much do you experience symptoms from your diabetes?”); consequences (“how much does diabetes affect your life?”); timeline (“how long do you think your diabetes will continue?”); personal control (“how much control do you feel you have over your diabetes?”); illness coherence (“how well do you feel you understand your diabetes?”); emotional response (“how much are you emotionally affected by your illness?”); concern (“how concerned are you about your diabetes?”).²² The treatment control item (“how much do you think your treatment can help control your illness?”) was repeated three times with “treatment” replaced with “medication”, “exercise” and “diet” respectively, similar to previous research.¹³ These items were scored on a scale from 0 (lowest score) to 10 (highest score). The ninth item was an open-ended question (“please list in rank-order the three most important factors that you believe caused your diabetes”). The first factor listed was coded by two independent researchers into categories. In accordance with the BIPQ guidelines, the word “illness” was replaced with “diabetes”.

Diabetes self-care behaviours. To reduce participant burden, a shortened version of the revised Summary of Diabetes Self-Care Activities scale (SDSCA) was administered.²³ Five of the 11 core

items plus two of the additional items were used to assess self-care behaviours. Participants were asked to circle the number of days in the past week, from 0 (never) to 7 (every day), that each self-care activity was performed. The researchers consulted with a dietician and podiatrist at the Auckland Diabetes Centre to determine which items from the SDSCA were most relevant. One item from each of the following subscales was administered: diet, exercise, blood sugar testing, foot care, and smoking. Two questions on the number of days participants took their insulin and diabetes pills were used from the additional 14 SDSCA items, with scores from these two questions averaged if applicable. All seven questions utilised are shown in Appendix A.

Demographics. Standard demographic data was collected on age, sex, ethnicity, smoking (“do you currently smoke? yes or no”), employment status and education level.

Medical records

Glycaemic control. Each participant's most recent HbA1c result was extracted from the patient's medical record.

Retinopathy. The stage of retinopathy was extracted from the participant's most recent screening result. Stages ranged from no retinopathy, mild, moderate to severe.

Nephropathy. The chronic kidney disease (CKD) stage was determined from the participant's most recent estimated glomerular filtration rate (eGFR) as reported on their laboratory record. The New Zealand Ministry of Health²⁵ has set stages of CKD; stage 1 CKD (eGFR >90), stage 2 CKD (eGFR 60–90), stage 3 CKD (eGFR 59–30), stage 4 (eGFR 29–15), and stage 5 (eGFR <15).

Neuropathy was scored as present or absent from medical records.

Data analysis

Data were analysed using SPSS version 25. Demographic and clinical data were reported as percentages and means within each ethnic group. Independent samples t-tests and Chi-squared tests were employed to explore differences between Māori and NZ Europeans in demographic and clinical variables, illness perceptions and self-care behaviours. Any significant differences in demographic or clinical variables between the two groups were then controlled for using ANCOVAs to assess if the differences in illness perceptions remained when controlling for these variables. Chi-squared tests were used to compare

differences in causal perceptions between the two groups. Univariate analyses were conducted to assess correlations between illness perceptions, HbA1c, and self-reported medication adherence for Māori and NZ Europeans. Multiple regression analyses were conducted entering those variables found to be associated with HbA1c and self-reported medication in the previous analyses.

Results

Demographic and clinical characteristics

The demographic and clinical characteristics of the two ethnic groups are provided in Table 1. Significant differences between the two groups were found for age, employment status, education level, smoking status and HbA1c. NZ Europeans were significantly older than Māori, had higher education and lower HbA1c, were less likely to smoke, and less likely to be working.

Differences in illness perceptions

Māori perceived diabetes to have a larger effect on their lives (more consequences), reported experiencing more severe symptoms (higher identity), were more concerned about diabetes, and reported that diabetes affected them more emotionally than NZ Europeans did (Table 2). There were no significant group differences for perceived timeline, personal control, treatment control or illness coherence.

Adding the covariates of age, employment, education level, smoking and HbA1c, did not change the significance levels for consequences and illness identity (see Table 3). However, the differences in illness concern and emotional representations became non-significant. The difference between groups in illness coherence became significant, with the estimated marginal mean for Māori significantly higher than NZ Europeans when controlling for the co-variates, with a small effect size. Therefore, the demographic and clinical differences between Māori and NZ Europeans accounted for some of the differences in illness perceptions. Timeline, personal control, treatment control (diet), treatment control (exercise) and treatment control (medication) remained non-significant.

Causal perceptions were coded into six themes: (1) food and drink related (e.g., “sweet eating”, “beer”); (2) lifestyle (e.g., “no exercise”, “lifestyle”); (3) emotions and stressors (e.g., “stress”, “worries”); (4) genetics (e.g., “genes”, “hereditary”); (5) weight related (e.g., “obesity”, “weight can’t lose it”); (6)

other (e.g., “a family curse”, “medication I am on”). More Māori perceived the cause of T2DM to be related to food and drink, whereas more NZ Europeans perceived the cause to be related to weight (see Table 4).

Differences in self-care

As shown in Table 5, significantly more NZ Europeans took part in a healthy eating plan than Māori, and reported that they took medications on more days than Māori. More Māori participants smoked (18/85; 21%) than did NZ Europeans (5/85; 6%), Pearson’s Chi-squared 8.50, $p < 0.01$. (Note: these results slightly differ to Table 1 due to differences in the way the question was phrased – see Appendix). Among those who smoked, the mean number of cigarettes for Māori was 10.0 (SD 11.25), and for NZ Europeans was 9.8 (SD 7.25), $t(21)=0.98$. There were no significant differences in the other self-care behaviours.

For medication adherence, the estimated marginal mean for Māori (Mean=6.1; 95%CI [5.7, 6.5]) was no longer significantly different to NZ Europeans when controlling for the co-variates (Mean=6.5; 95%CI [6.1, 6.9]), $F(1,147)=1.6$, $p=0.20$, $\eta^2=0.0$; indicating that the differences in medication adherence could be accounted for by the different demographic and clinical factors between the groups. The significance of the remaining analyses did not change.

Associations between illness perceptions, HbA1c, and medication adherence

The associations between illness perceptions, HbA1c and medication adherence for each ethnic group separately are shown in Table 6. Among demographic variables, older age was associated with lower HbA1c ($r=-0.3$; $p<0.01$) and higher medication adherence ($r=0.3$; $p=0.03$) in NZ Europeans, and those who were employed had higher adherence than unemployed or retired persons ($t(75) = 2.77$; $p=0.01$). No demographic variables were associated with medication adherence or HbA1c for Māori.

Multivariate analyses. The first step of the regression for HbA1c in NZ Europeans was significant, $F_{(1,79)}=7.9$, $p=0.01$, $R^2=0.1$, adjusted $R^2=0.1$. Approximately 9% of the variance in HbA1c for NZ Europeans could be explained by age, with older age associated with lower HbA1c. The second step (with the inclusion of perceived consequences, treatment control [exercise], identity, illness concern, and emotional representations) explained a

Table 1: Summary of demographic and clinical characteristics in participants across ethnic groups.

Demographic variable	NZ European (n=85)	Māori (n=85)	p-value
Age in years, mean (SD)	65.0 (11.8)	55.9 (12.5)	<0.01a
Gender, n (%)			0.63b
Male	58 (68.2%)	55 (64.7%)	
Female	27 (31.8%)	30 (35.3%)	
Employment status, n (%)			0.02b
Employed	42 (49.4%)	58 (68.2%)	
Unemployed	5 (5.9%)	6 (7.1%)	
Retired	37 (43.5%)	20 (23.5%)	
Missing data, n	1	1	
Education level, n (%)			<0.01b
High School	56 (65.9%)	73 (85.9%)	
Tertiary	29 (34.1%)	10 (11.8%)	
Missing data, n	0	2	
Currently smoking, n (%)			<0.01b
Yes	4 (4.7%)	17 (20.0%)	
No	81 (95.3%)	68 (80.0%)	
HbA1c (mmol/mol), mean (SD)	66.2 (17.6)	75.0 (22.4)	<0.01a
Duration of diabetes (years), mean (SD)	11.5 (7.9)	10.9 (8.6)	0.59a
Retinopathy, n (%)			
None	60 (70.6%)	50 (58.8%)	0.27bc
Mild	18 (21.2%)	23 (27.1%)	
Moderate–Severe	6 (7.1%)	12 (14.1%)	
Missing data, n	1	0	
Nephropathy, n (%)			0.42bc
None	53 (62.3%)	54 (63.5%)	
Stage 2 CKD	14 (16.5%)	13 (15.3%)	
Stage 3 CKD	15 (17.6%)	10 (11.8%)	
Stage 4–5 CKD	3 (3.5%)	8 (9.4%)	
Neuropathy, n (%)			0.16b
Present	11	19	
Absent	70	63	
Not in medical record	4	3	

Note: % = percentage of participants in that category.

CKD = chronic kidney disease.

p value was calculated by independent samples T-Tests^a and Chi-squared tests.^b

Chi-squared tests^c were also not significant when data coded as no vs yes.

Table 2: Differences between Māori and New Zealand Europeans in illness perceptions.

Illness perceptions	Ethnic group				Mean difference	95%CI	t	df	p	d
	NZ European (n=85)		Māori (n=85)							
	Mean	SD	Mean	SD						
Consequences	3.6	2.5	5.0	3.1	-1.5	[-2.3, -0.6]	-3.4	167	<0.01	0.5
Timeline	8.2	2.7	7.5	2.9	0.7	[-0.1, 1.5]	1.6	166	0.10	0.3
Personal control	6.8	2.5	6.1	2.5	0.7	[-0.1, 1.5]	1.7	167	0.08	0.3
Treatment control (diet)	8.6	1.9	8.8	1.8	-0.1	[-0.7, 0.4]	-0.4	167	0.69	0.3
Treatment control (exercise)	8.5	1.9	8.5	2.0	-	[-0.6, 0.6]	-0.0	167	0.98	0.0
Treatment control (medication)	7.7	2.4	7.4	2.6	0.3	[-0.4, 1.1]	0.9	162	0.37	0.1
Identity	2.6	2.6	4.8	2.7	-2.2	[-3.0, -1.4]	-5.4	164	<0.01	0.8
Illness concern	5.7	3.0	7.2	2.9	-1.5	[-2.3, -0.7]	-3.3	168	<0.01	0.5
Coherence	7.4	2.4	7.4	2.7	0.1	[-0.7, 0.8]	0.1	168	0.92	0.0
Emotional representations	3.3	3.1	5.0	3.3	-1.8	[-2.8, -0.7]	-3.6	166	<0.01	0.6

Table 3: Multivariate differences between Māori and NZ Europeans in illness perceptions controlling for age, employment status, education level, smoking and HbA1c.

Illness perceptions	Ethnic group				Mean difference	95%CI	F	df	p	η_p^2
	NZ European (n=85)		Māori (n=84)							
	Adj. Mean	SE	Adj. Mean	SE						
Consequences	3.7	0.3	4.9	0.3	-1.2	[-2.1, -0.2]	5.6	157	0.02	0.0
Timeline	7.9	0.3	7.7	0.3	0.1	[-0.9, 1.1]	0.1	156	0.78	0.0
Personal control	6.3	0.3	6.5	0.3	-0.2	[-1.0, 0.6]	0.2	157	0.64	0.0
Treatment control (diet)	8.6	0.2	8.8	0.2	-0.2	[-0.9, 0.4]	0.4	157	0.52	0.0
Treatment control (exercise)	8.5	0.2	8.5	0.2	0.0	[-0.6, 0.7]	0.0	157	0.92	0.0
Treatment control (medication)	7.6	0.3	7.6	0.3	0.1	[-0.8, 0.9]	0.0	152	0.92	0.0
Identity	2.8	0.3	4.6	0.3	-1.8	[-2.7, -0.9]	15.7	154	<0.01	0.1
Illness concern	5.9	0.3	6.9	0.4	-1.0	[-2.0, 0.0]	3.6	158	0.06	0.0
Coherence	7.0	0.3	7.9	0.3	-0.9	[-1.7, -0.1]	5.1	158	0.03	0.0
Emotional representations	3.8	0.4	4.4	0.4	-0.6	[-1.6, 0.5]	1.1	156	0.30	0.0

Table 4: Chi-squared tests showing differences between Māori and NZ Europeans in causal perceptions of diabetes (categorised).

Causal categories	Ethnic group		χ^2	df	p	v
	NZ European (n=78)	Māori (n=18)				
Food and drink related, n(%)	25 (32.1%)	45 (55.6%)	9.6	1	<0.01	0.2
Lifestyle, n(%)	6 (7.7%)	4 (4.9%)	0.4	1	0.50	0.1
Emotions and stressors, n(%)	7 (9.0%)	4 (4.9%)	0.9	1	0.34	0.1
Genetics, n(%)	16 (20.5%)	15 (18.5%)	0.1	1	0.81	0.0
Weight related, n(%)	17 (21.8%)	4 (4.9%)	9.4	1	<0.01	0.2
Other, n(%)	7 (9.0%)	9 (11.1%)	0.3	1	0.62	0.0

Table 5: Differences between Māori and NZ Europeans in self-care behaviours, measured from 0 (never) to 7 (every day).

Days per week	Ethnic group				Mean difference	95% CI	t	df	p	d
	NZ European (n=85)		Māori (n=85)							
	Mean	SD	Mean	SD						
Diet	5.1	1.9	4.0	2.4	1.1	[0.5, 1.8]	3.3	158	<0.01	0.5
Exercise	3.7	2.4	3.5	2.7	0.3	[-0.5, 1.1]	0.7	168	0.47	0.1
Blood sugar testing	4.1	3.2	3.6	3.2	0.5	[-0.5, 1.4]	0.9	168	0.35	0.1
Foot care	2.7	2.8	3.3	2.9	-0.6	[-1.5, 0.2]	-1.4	166	0.16	0.2
Medication	6.6	1.2	6.0	2.2	0.6	[0.1, 1.2]	2.2	155	0.03	0.3

Table 6: Correlations between illness perceptions, HbA1c, and medication adherence in NZ Europeans (n=85) and Māori (n=85).

	HbA1c		Medication adherence	
	NZ European	Māori	NZ European	Māori
Consequences	0.2	0.1	-0.1	0.1
Timeline	0.1	-0.1	0.2	0.1
Personal control	-0.1	-0.3	0.0	0.2
Treatment control (diet)	0.1	-0.1	0.1	0.1
Treatment control (exercise)	0.3	0.0	0.0	0.1
Treatment control (medication)	0.2	-0.2	0.3	0.3
Identity	0.3	0.2	0.0	0.1
Illness concern	0.3	-0.1	0.1	0.3
Coherence	0.1	-0.1	0.1	0.1
Emotional representations	0.4	0.1	0.0	0.0

Note: Bolded *p* value indicates significance at the $p < 0.05$ level.

further 20% of variance in HbA1c, $F_{(6,74)}=5.0$, $p < 0.01$, $R^2=0.3$, adjusted $R^2=0.2$. Higher perceived treatment control (exercise) $p=0.01$ explained a significant proportion of the variance in higher HbA1c levels.

The first step of the regression for medication adherence in NZ Europeans was significant, $F_{(2,72)}=4.2$, $p=0.02$, $R^2=0.1$, adjusted $R^2=0.1$. Approximately 10% of the variance in medication use for NZ Europeans could be explained by age and employment. The second step significantly explained a further 7% of variance, $F_{(3,71)}=4.9$, $p < 0.01$, $R^2=0.2$, adjusted $R^2=0.1$. Higher perceived treatment control about medication was significantly associated with higher medication adherence.

The simple regression for medication adherence in Māori was significant, $F_{(2,75)}=4.88$, $p=0.01$, $R^2=0.12$, adjusted $R^2=0.09$. Approximately 12% of the variance in medication adherence for Māori could be explained by the model, with higher perceived treatment control and higher illness concern associated with better medication adherence.

Discussion

The major findings show that among patients attending outpatient clinics for T2DM, Māori were affected at a younger age than NZ Europeans, less likely to have tertiary education, more likely

to smoke and have an unhealthy diet, poorer adherence, and less optimal blood glucose control. Māori accurately perceived more symptoms and worse consequences than did NZ Europeans. These findings align with previous research showing poorer health outcomes in Māori in New Zealand.^{1,2} It is therefore important that steps are taken to try to reduce these inequities.

The finding that the study sample of Māori were younger than NZ Europeans is consistent with epidemiological research showing Indigenous peoples are diagnosed with diabetes at a younger age.²⁴ The increased proportion of Māori with diabetes who were working poses greater barriers for Māori to attend centrally located appointments, especially if work is a long way from clinics, and pay may be docked for hours off. This is an example of unintentional institutionalised racism, whereby there is differential access to care. Consideration could be given as to how clinics could be organised at other times and locations to reduce these barriers, with virtual telehealth a possible option to reduce duration of time off work.

Given that Māori attending diabetes clinics have greater risk factors and poorer glycaemic control, it is not surprising that Māori reported greater consequences of diabetes on their lives, and of being more emotionally affected than NZ Europeans. These findings reflect earlier results, showing Pasifika peoples had poorer metabolic control, perceived T2DM to have significantly more consequences and were more distressed than both NZ Europeans and South Asians.¹⁸ Further research is required to explore what of kind of support Māori and Pasifika need to improve risk factors, and reduce distress.

The way the data were categorised, more Māori believed food and drink were important causes of T2DM, whereas more NZ Europeans perceived weight as important. These are distinct but associated causes, since food and drink can influence weight, alongside other factors. Fortunately, both these perceived causes are modifiable and efforts to improve them should be incorporated into culturally specific diabetes management. Research in New Zealand has shown that clinicians do provide education about the importance lifestyle management, but often don't take into account patients' pre-existing knowledge or social context.²⁵ It is important for healthcare providers to take wider environmental and socio-cultural influences on behaviours into account.

For NZ Europeans, perceiving exercise as more effective and being more emotionally affected were both significantly associated with higher HbA1c. Being more emotionally affected was also associ-

ated with higher HbA1c in Europeans and South Asians in earlier work.¹⁸ However, it is unclear why higher perceptions that exercise can control diabetes would be linked to higher HbA1c; it is possible that some NZ Europeans attribute their poor control to their lack of exercise. More research is needed to replicate this survey and investigate the directionality of this association. Feeling less able to control diabetes was associated with higher HbA1c for Māori, which aligns with findings from a previous older study in NZ Europeans, Pasifika peoples and South Asians.¹⁸ It is surprising that this association was not found for NZ Europeans in this study, although the correlation was in the expected direction. As expected, stronger perceptions that treatment could control diabetes were associated with better adherence for both Māori and NZ Europeans; this was found in previous work in Pasifika patients.¹⁸

Together, these findings suggest that emphasis should be placed on addressing personal and treatment control perceptions in clinical consultations and in the development of psychoeducational interventions. Further research is needed to investigate how changes to clinical management could affect risk factors and clinical outcomes. Interventions based on Leventhal's Common Sense Model have been shown to be effective in increasing perceptions of both treatment and personal control with some preliminary evidence for effects on glycaemic control.¹⁴ These interventions typically target patients with poor glycaemic control, and involve asking about and responding to patients' and family members' perceptions of diabetes, addressing specific concerns with tailored psycho-education, discussing barriers to the adoption of behaviour change, and co-developing an action plan with patients and family. Visual information about health may be especially beneficial for people with low health literacy.²⁶ Furthermore visual-based interventions have been shown to increase adherence to medication in HIV in a largely non-white African population.²⁷ A recent feasibility study found that a short diabetes visual animation was well received by patients in New Zealand, and future research could further develop this.²⁸ For Māori, interventions should include establishing trust, connection (whanaungatanga) and respect (manaakitanga) with the patient, as well as fostering empowerment (rangatiratanga). The presence of cultural support and/or family (whānau) in consultations with Māori patients is also important. Previous research has recommended that healthcare systems are engaged in working towards cultural safety.²⁹

Overall, the results support an argument that assessing illness perceptions in outpatients with T2DM could be an important addition to their treatment plan. It is important for healthcare providers to consider cultural differences when providing information and treatment advice. The current study identified significant differences in self-care behaviours between Māori and NZ Europeans, providing a valuable avenue for health practitioners to discuss Māori patients' concerns about the barriers they face in adhering to dietary and medication regimes. These barriers may be broad factors such as institutionalised racism, or structural factors, such as socio-economic status.

A strength of this study is specifically investigating illness perceptions and how these are associated with self-care behaviours in Māori with diabetes, which is novel. Māori were oversampled in order to reach the required sample size, and to have sufficient power to detect differences between groups, and we had good response rates. Limitations include the cross-sectional design which does not allow causality and directionality to be determined. The sample is only representative of outpatients who attended their scheduled appointments; patients who do not attend appointments may have different levels of adherence, risk factors, and perceptions, so the findings should be interpreted with caution. Nevertheless, the sample was representative of diabetes outpatients, with typically more risk factors and complications. Future research could recruit from hospitals and the community to try to capture a wider range of patients. A further limitation was the use of a shortened version of the self-care ques-

tionnaire, which may affect its reliability, and we did not assess blood pressure or lipids since these were not the main focus of the study. Although the self-report measures have previously been used with Māori patients, they have yet to be specifically validated in Māori populations.

Conclusion

This study corroborates previous findings showing disparities in diabetes risk factors (smoking, unhealthy diet), younger age of onset, and poorer blood glucose control for Māori compared to NZ Europeans, in a sample of attendees at diabetes outpatient clinics. Māori accurately perceived more severe symptoms and consequences of their diabetes than NZ Europeans, and that food and drink were important causes of diabetes. Perceptions of greater treatment effectiveness were associated with higher medication adherence. Future research needs to develop and test psychological interventions for diabetes outpatients in a New Zealand context to see effects on perceptions, risk factors, engagement in self-care behaviours, glycaemic control, and complications. Asking patients about their perceptions of diabetes may allow patients' views to be acknowledged, allow clinical education to be better tailored and interactive, increase mutual understanding and enhance engagement in self-care, with subsequent benefits for risk factors and blood glucose control. This research lends further support for incorporating psychological and cultural factors into clinical strategies and treatment to improve health outcomes, particularly for Indigenous groups.

COMPETING INTERESTS

Nil.

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REFERENCES

1. Ministry of Health. Annual Data Explorer 2019/20: New Zealand Health Survey. Ministry of Health; 2020. [Available at: <https://www.health.govt.nz/publication/annual-update-key-results-2019-20-new-zealand-health-survey>].
2. Atlantis E, Joshy G, Williams M, Simmons D. Diabetes Among Māori And Other Ethnic Groups In New Zealand. In: Dagogo-Jack S, editor. *Diabetes Mellitus in Developing Countries and Underserved Communities*. Cham: Springer International Publishing; 2017.p.165-90
3. Koye DN, Magliano DJ, Nelson RG, Pavkov ME. The global epidemiology of diabetes and kidney disease. *Adv Chronic Kidney D*. 2018. 1;25(2):121-32.
4. Crowshoe L, Dannenbaum D, Green M, et al. Type 2 diabetes and Indigenous peoples. *Can J Diabetes*. 2018 Apr 1;42:S296-306.
5. Hobbs M, Ahuriri-Driscoll A, Marek L, et al. Reducing health inequity for Māori people in New Zealand. *Lancet* 2019 Nov2;394(10209): 1613-4.
6. Talamaivao N, Harris R, Cormack D, et al. Racism and health in Aotearoa New Zealand: A systematic review of quantitative studies. *NZ Med J*. 2020;133:55-68.
7. Hagger MS, Orbell S. The common sense model of illness self-regulation: a conceptual review and proposed extended model. *Health Psychol Rev*. 2021 Jan 28:1-31
8. Broadbent E, Wilkes C, Koschwanez H, et al. A systematic review and meta-analysis of the Brief Illness Perception Questionnaire. *Psychol Health*. 2015;30:1361-85.
9. Strauss SM, Rosedale MT, Kaur N. Illness perceptions among adults at risk for diabetes. *Diabetes Educ*. 2015;41:195-202.
10. Barnes L, Moss-Morris R, Kaufusi M. Illness beliefs and adherence in diabetes mellitus: a comparison between Tongan and European patients. *NZ Med J*. 2004;117.
11. Mc Sharry J, Moss-Morris R, Kendrick T. Illness perceptions and glycaemic control in diabetes: A systematic review with meta-analysis. *Diabetic Med*. 2011;28:1300-10.
12. Abubakari AR, Jones MC, Lauder W, et al. Associations between knowledge, illness perceptions, self-management and metabolic control of type 2 diabetes among African and European-origin patients. *J Nurs Healthc Chronic Illn*. 2011;3:245-56.
13. Broadbent E, Donkin L, Stroh JC. Illness and treatment perceptions are associated with adherence to medications, diet, and exercise in diabetic patients. *Diabetes Care*. 2011;34:338-40.
14. Alyami M, Serlachius A, O'Donovan CE, et al. A systematic review of illness perception interventions in type 2 diabetes: Effects on glycaemic control and illness perceptions. *Diabetic Med*. 2021;38:e14495.
15. Alyami M, Serlachius A, Mokhtar I, Broadbent E. The association of illness perceptions and God locus of health control with self-care behaviours in patients with type 2 diabetes in Saudi Arabia. *Health Psychol Beh Med*. 2020;8:329-48.
16. Alzubaidi H, Mc Narmara K, Kilmartin GM, et al. The relationships between illness and treatment perceptions with adherence to diabetes self-care: A comparison between Arabic-speaking migrants and Caucasian English-speaking patients. *Diabetes Res Clin Pract*. 2015;110:208-17.
17. Huang YC, Zuñiga J, García A. Illness perceptions as a mediator between emotional distress and management self-efficacy among Chinese Americans with type 2 diabetes. *Ethn Health*. 2020:1-5.
18. Bean D, Cundy T, Petrie KJ. Ethnic differences in illness perceptions, self-efficacy and diabetes self-care. *Psychol Health*. 2007;22:787-811.
19. Dalbeth N, Petrie KJ, House M, et al. Illness perceptions in patients with gout and the relationship with progression of musculoskeletal

- disability. *Arthritis Care Res.* 2011;63:1605-12.
20. Sanders D, Kydd R, Morunga E, Broadbent E. Differences in patients' perceptions of schizophrenia between Māori and New Zealand Europeans. *Aust NZ J Psychiatr.* 2011;45:483-8.
 21. Faul F, Erdfelder E, Buchner A, Lang AG. Statistical power analyses using G* Power 3.1: Tests for correlation and regression analyses. *Beh Res Methods.* 2009;41:1149-60.
 22. Broadbent E, Petrie KJ, Main J, Weinman J. The brief illness perception questionnaire. *J Psychosom Res.* 2006;60:631-7.
 23. Toobert DJ, Hampson SE, Glasgow RE. The summary of diabetes self-care activities measure: Results from 7 studies and a revised scale. *Diabetes Care.* 2000;23:943-50.
 24. Ludwig K, Craig ME, Donaghue KC, et al. ADDN Study Group. Type 2 diabetes in children and adolescents across Australia and New Zealand: A 6-year audit from The Australasian Diabetes Data Network (ADDN). *Pediatr Diabetes.* 2021 May;22(3):380-7.
 25. Dowell A, Stubbe M, Macdonald L, et al. A longitudinal study of interactions between health professionals and people with newly diagnosed diabetes. *Ann Fam Med.* 2018 Jan 1;16(1):37-44.
 26. Jones AS, Kleinstäuber M, Martin LR, et al. Development and validation of the health visual information preference scale. *Brit J of Health Psych.* 2019 Sep;24(3):593-609.
 27. Jones AS, Coetzee B, Kagee A, et al. The use of a brief, active visualisation intervention to improve adherence to antiretroviral therapy in non-adherent patients in South Africa. *AIDS Behav.* 2019 Aug;23(8):2121-9.
 28. Alyami M, Serlachius A, Law M, Murphy R, Almgibbal TH, Lyndon M, Batais MA, Algaw RK, Broadbent E. Utility and acceptability of a brief type 2 diabetes visual animation: Mixed methods feasibility study. *JMIR Formative Research.* 2022;9(6(8):e35079.
 29. Curtis E, Jones R, Tipene-Leach D, et al. Why cultural safety rather than cultural competency is required to achieve health equity: a literature review and recommended definition. *Int J Equity Health.* 2019 Dec;18(1):1-7.

Appendix

Appendix 1: Items used from the SDSCA.²³

1. How many of the last SEVEN DAYS have you followed a healthy eating plan?
2. On how many of the last SEVEN DAYS did you participate in at least 30 minutes of physical activity? (Total minutes of continuous activity, including walking.)
3. On how many of the last SEVEN DAYS did you test your blood sugar?
4. On how many of the last SEVEN DAYS did you check your feet?
5. Have you smoked a cigarette—even one puff—during the past SEVEN DAYS?
6. If yes, how many cigarettes did you smoke on an average day?
7. On how many of the last SEVEN DAYS did you take your recommended insulin injections?*
8. On how many of the last SEVEN DAYS did you take your recommended number of diabetes pills?*

*Note: a “not applicable” option was provided for these items.