Original Research

Barriers to insulin treatment among Australian Torres Strait Islanders with poorly controlled diabetes

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Abstract

Objective: To explore self reported knowledge and attitudes to insulin treatment among a group of adults with poorly controlled diabetes in the Torres Strait islands.

Design: Cross-sectional survey in 2014, interviews with 29 adults with HbA1c $\geq$ 8.5% (69 mmol mol^{-1}) and not taking insulin, using Insulin Treatment Appraisal Scale (ITAS) and Barriers to Insulin Treatment Questionnaire (BITQ) scores.

Setting: Five remote Torres Strait Island communities in the Torres Strait region.

Participants: Poorly controlled insulin-naïve type 2 diabetics.

Main outcome measures: BITQ and ITAS scores on items related to knowledge and attitudes to insulin treatment, clinical and demographic measures.

Results: Overall, 34% of the cohort had poor glycaemic control. Compared to those with HbA1c $\geq$ 8.5% and taking insulin (n = 37), the 29 insulin-naïve participants were more obese, more likely to smoke and drink alcohol, have lower mean HbA1c and fewer years with diabetes. Among the insulin-naïve group, those reporting higher 'barriers' (BITQ scores) were older and with lower formal education than those reporting fewer barriers. Torres participants consistently scored low on 'knowledge' items in the ITAS, especially those which would guide insulin initiation (insulin improves glucose control and prevents complications).

Conclusion: Compared to other published studies, the Torres participants had higher scores for BITQ 'barrier' items and lower 'knowledge' scores. This suggests better education around glycaemic control with medication and discussion of perceptions and exchange of experiences with peers who are taking insulin might improve the uptake of insulin in this high-risk group.

KEY WORDS: *psychological insulin resistance, Torres Strait Islander, type 2 diabetes.*

Introduction

Type 2 diabetes is a chronic progressive condition[1] where many patients will eventually require insulin in addition to oral hypoglycaemic agents to control glycaemia and prevent complications.[2] Current guidelines recommend commencement of insulin when dietary and maximum oral hypoglycaemic treatment fails to maintain adequate blood glucose control to maintain HbA1c levels below 8.5% (69 mmol mol^{-1}).[3] However, many patients are reluctant to commence insulin treatment for a variety of reasons,[4] some of which reflect poor knowledge of modern delivery methods and many of which relate to beliefs about stigma, danger and inconvenience.[5] These negative and complex perceptions have been collectively called 'psychological insulin resistance' (PIR)[6] and recently developed insulin appraisal scales have been validated in adults with diabetes in Australia.[7]

Torres Strait Islanders have the highest prevalence of diabetes in Australia, and high rates of avoidable complications, especially renal failure, skin ulceration and lower limb amputation.[8] Clinical reports suggest that glycaemic control is especially poor[9] compared to other groups with diabetes; however, rates of insulin treatment remain low,[10] suggesting opportunities to improve guideline-concordant care and reduce complications in the primary care setting. Anecdotal evidence suggests that PIR is high in this population, as reported by clinicians.

The Insulin Treatment Appraisal Scale (ITAS) is a brief, psychometrically validated instrument that can

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What is already known on this subject?
- *Torres Strait Islanders have the highest prevalence of type 2 diabetes in Australia and high rates of avoidable complications.*
- *Many patients are reluctant to commence insulin treatment for a variety of reasons which include stigma, danger and inconvenience.*

What does this study add?
- *Poorly controlled insulin-naïve type 2 diabetics in the remote Torres Strait region mostly had negative perceptions of insulin, which could be significant barriers to better glycaemic management.*
- *Perceived barriers to insulin treatment are high in this population, especially among those who are older with fewer years of formal education.*
- *Improving the uptake of insulin for those who could benefit from it will require better communication between service providers and clients.*

be used in insulin-naïve patients to assess both positive and negative perceptions of insulin treatment and what changes might be expected from these perceptions.[11] The Barriers to Insulin treatment Questionnaire (BTIQ) measures has been validated in two populations of adults with diabetes in Germany.[12]

The present study aimed to investigate the perceptions and beliefs of Torres Strait Islander adults with poorly controlled diabetes with respect to using insulin to control blood sugar using the ITAS and BTIQ scales. We anticipated this information might be useful in both understanding perceptions and knowledge of insulin with a view to better communication by clinicians and the more effective use of medicines in this high-risk group.

Methods

The study population was selected from the register of 197 adults with T2DM in five outer islands in the Torres Strait region (see Fig 1) who all provided consent for interview and data collection. Sixty-seven (34%) of these had HbA1c levels ≥8.5% and of these 29 were not taking insulin. The 29 insulin-naïve
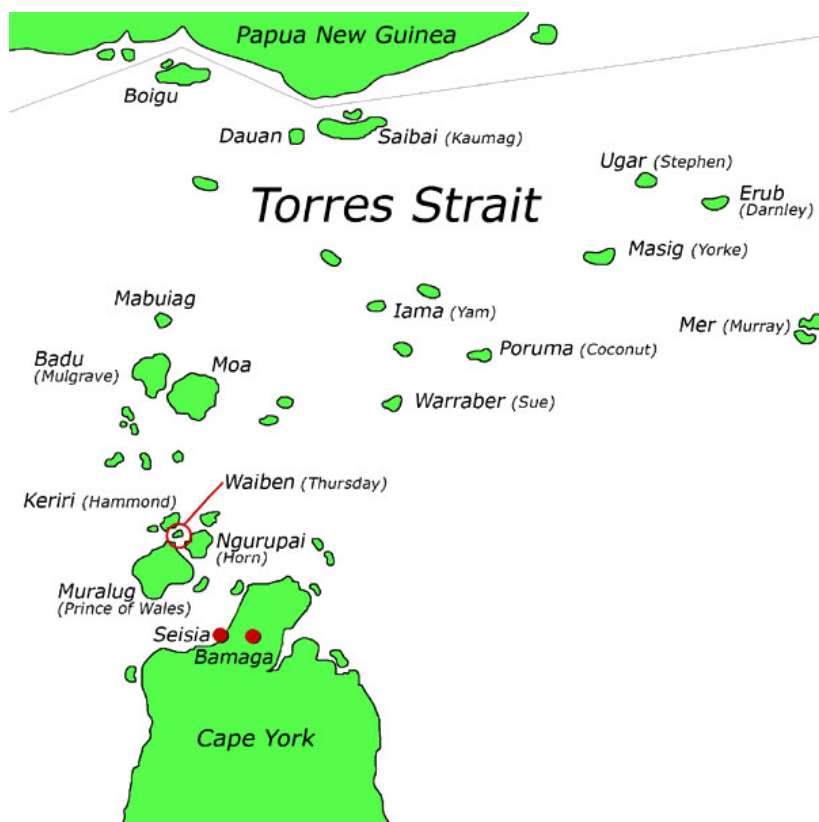

FIGURE 1: *Map of the Torres Strait Region.*

participants were interviewed by one of us fluent in local Creole, using the ITAS and BITQ instruments in the participant's home or local health service. Clinical data were abstracted from clinic files (patient hard copy files, patient information system – Best Practice, Ferret and Auslab). Interview data included years of formal education, current employment, current household income, smoking and alcohol intake, average time

TABLE 1: *Categorical demographic and behavioural variables by HbA1c (%) and insulin prescription status of Torres Strait Islanders with diabetes*

Demographic, behavioural and diabetes care variables	HbA1c < 8.5	HbA1c ≥ 8.5		Total
	No. (%)	On insulin No. (%)	Not on insulin No. (%)	No. (%)
Total	130	37	30	197
Gender				
Male	51 (39.2)	9 (24.3)	15 (50.0)	75 (38.1)
Female	79 (60.8)	28 (75.7)	15 (50.0)	122 (61.9)
Age				
<35 years	2 (1.5)	3 (8.1)	4 (13.3)	9 (4.6)
35–49 years	21 (16.2)	9 (24.3)	7 (23.3)	37 (18.8)
50+ years	107 (82.3)	25 (67.6)	19 (63.3)	151 (76.6)
Body Mass Index (BMI)				
Healthy BMI (18.5–24.9)	15 (11.5)	4 (10.8)	2 (6.7)	21 (10.7)
Overweight BMI (25.0–29.9)	37 (28.5)	10 (27.0)	5 (16.7)	52 (26.4)
Obese BMI (30+)	78 (60.0)	23 (62.2)	23 (76.7)	124 (62.9)
Employment				
Employed fulltime	42 (34.1)	13 (37.1)	9 (30.0)	64 (32.5)
Employed part-time/casual	5 (4.1)	3 (8.6)	5 (16.7)	13 (6.6)
Not currently employed	76 (61.8)	19 (54.3)	16 (53.3)	111 (56.3)
No response/missing	7	2	0	9
Education				
Year 12 not completed	86 (69.9)	20 (57.1)	17 (56.7)	123 (62.4)
Year 12 completed	10 (8.1)	6 (17.1)	6 (20.0)	22 (11.2)
TAFE course	21 (17.1)	9 (25.7)	7 (23.3)	37 (18.8)
Undergraduate	6 (4.9)	0 (0.0)	0 (0.0)	6 (3.0)
No response/missing	7	2	0	9
Household income				
<$20 000	2 (1.6)	1 (2.9)	0 (0.0)	3 (1.5)
$20 000–$59 999	69 (56.1)	17 (48.6)	18 (60.0)	104 (52.8)
$>60 000	52 (42.3)	17 (48.6)	12 (40.0)	81 (41.1)
No response/missing	7	2	0	9
Smoking				
Non smoking	104 (84.6)	30 (85.7)	19 (63.3)	153 (77.7)
Yes smoking	19 (15.4)	5 (14.3)	11 (36.7)	35 (17.8)
No response/missing	7	2	0	9
Alcohol				
No alcohol	91 (74.0)	24 (68.6)	17 (56.7)	132 (67.0)
Alcohol	32 (26.0)	11 (31.4)	13 (43.3)	56 (28.4)
No response/missing	7	2	0	9
Coordination of diabetes care				
Extremely well (1)	14 (11.4)	1 (2.9)	2 (6.7)	17 (8.6)
Very well (2)	98 (79.7)	28 (80.0)	26 (86.7)	152 (77.2)
Fairly well/Badly (3)	11 (8.9)	6 (17.1)	2 (6.7)	19 (9.6)
No response	7	2	0	9

(hours) watching television per week, regular physical exercise, years since diagnosis, self-reported medication adherence and perceptions of quality of diabetes care. Clinical data included most recent HbA1c, blood pressure, lipids, renal function and prescribed medicines.

Ethics approval was obtained from the Human Research Ethics Committee Cairns and Hinterland, Cape York, Torres Strait – Northern Peninsula Hospital and Health Service (now known as Far North Queensland Ethics Committee) – HREC Reference number: HREC/13/QCH/126-875. Ethics approval was also provided by the Human Research Ethics Committee – James Cook University, approval number HREC/H5666. A student non-commercial research agreement was established between The Torres and Cape Hospital and Health Service and the first author (ST).

Measures

Responses to the 14 BITQ items were scored from 1 (Strongly Disagree) to 10 (Strongly Agree) with a score of 7–10 indicating Agree/Strongly Agree. A total BITQ score for each person was derived by summing responses to the 14 items. The scores for three positively worded BITQ items, 4, 5 and 6, were first reversed so a high score indicated low positive appraisal of insulin. Dividing each

person's total score by 14, the number of BITQ items, derived an average of the total score. Five sub-scales measuring different components of insulin resistance were created following the method of Petrak *et al.*[12]

Responses to the 20 ITAS items (1 = Strongly Disagree, 5 = Strongly Agree) were summed to create a total score for each person. Four items, 3, 8, 17 and 19, were reversed prior to creation of this total score. Summing scores from the 16 negatively worded items created a total negative sub-scale. The positive sub-scale was the sum of the unreversed four positive items. Exercise was measured as a 7-day recall of daily moderate to very hard physical activity in minutes. Total daily minutes were summed to create an aggregated exercise time in minutes and then hours for the preceding 7 days. Screen time was recorded as total hours watching TV, videos, games and internet per night during the preceding 7 days. Total hours per night were summed to create an aggregated screen time in hours.

Statistical analysis

Descriptive statistics were used to explore the distribution of categorical demographic and behavioural variables by three groups of glycaemic control and insulin prescription status groups. These groups were HbA1c

TABLE 2: *Continuous demographic, clinical and behavioural variables by HbA1c (%) and insulin prescription status among Torres Strait Islanders with diabetes, one-way analysis of variance (ANOVA)*

Demographic, clinical and behavioural variables	HbA1c < 8.5 (*n* = 130)		HbA1c ≥ 8.5–Insulin prescription status				Total (*n* = 197)		*P*
			Prescribed (*n* = 37)		Not prescribed (*n* = 30)				
	Mean	95% CI	Mean	95% CI	Mean	95% CI	Mean	95% CI	
Age	60.66	(58.50–62.82)	55.51	(51.33–59.69)	52.05	(47.19–56.91)	58.38	(56.57–60.20)	0.001
HbA1c (%)[a]	6.73	(6.63–7.00)	11.12	(10.66–12.48)	9.97	(9.57–11.24)	7.37	(7.18–7.98)	<0.001
Body Mass Index (BMI)	32.52	(31.34–33.71)	32.26	(30.21–34.31)	35.33	(32.28–38.38)	32.90	(31.92–33.88)	0.115
Exercise	4.43	(3.90–4.96)	4.14	(3.21–5.08)	5.08	(3.88–6.27)	268.55	(242.91–294.20)	0.442
Screen time[a]	28.00	(24.62–28.00)	28.00	(21.00–35.00)	28.00	(14.00–34.10)	28.00	(28.00–28.00)	0.540
Years with diabetes	8.87	(7.66–10.08)	13.30	(10.57–16.03)	7.96	(5.70–10.23)	9.53	(8.51–10.55)	0.002
Diabetes care (1 = Very good, 9 = Very poor)									
Knowledge of treatment	3.89	(3.61–4.18)	3.49	(3.00–3.97)	4.10	(3.55–4.65)	3.85	(3.63–4.07)	0.243
Appointment attendance[a]	2.00	(2.00–2.00)	2.00	(2.00–2.81)	3.00	(2.00–3.00)	2.00	(2.00–2.00)	0.096
Medication adherence	2.00	(1.81–2.19)	2.20	(1.87–2.53)	2.57	(2.10–3.03)	2.13	(1.97–2.29)	0.037
Coordination of diabetes care	1.98	(1.89–2.06)	2.14	(2.00–2.29)	2.00	(1.86–2.14)	2.01	(1.95–2.07)	0.137

[a]Variable not normally distributed, medians reported and Kruskal–Wallis one-way analysis of variance by ranks.

(%) <8.5, HbA1c (%) ≥8.5 and prescribed insulin and HbA1c (%) ≥8.5 and not prescribed insulin (Table 1). Continuous demographic variables were compared between these groups using means, confidence intervals and one-way analysis of variance (ANOVA). Medians and Kruskal–Wallis one-way ANOVA ranks were used for non-parametric variables (Table 2). The distribution of mean ITAS and BITQ scores for 29 insulin-naïve participants with poorly controlled glycaemia (HbA1c%≥8.5) was assessed across categorical demographic and behavioural variables. Categories of age and education were aggregated to accommodate the small number of participants. Differences in mean scores between categories in these variables were tested using ANOVAs and independent sample t-tests (Table 3).

Tables 4 and 5 display the mean scores and standard deviations for individual BITQ and ITAS items, respectively. The scores displayed for positive items on both scales are based on unreversed values, although these values were then reversed during the derivation of total summed scores. Results from other published comparison studies are included in these tables. Confidence intervals for means and proportions for this study and comparison studies were calculated and are reported in the text when comparing items and total scores across studies.

Results and discussion

Sixty-seven (34%) of the 197 adults with diabetes had poor glycaemic control (HbA1c ≥ 8.5%). They were younger, more likely to be obese, more likely to be smokers and alcohol drinkers than those with better glycaemic control (Table 1). They reported more years living with diabetes and lower medication adherence. In the poorly controlled group, those taking insulin had higher median HbA1c (11.1%, 98 mmol mol^{-1}) and longer duration of diabetes (13.3 years) compared to those not taking insulin (9.8%, 84 mmol mol^{-1}

TABLE 3: *Distribution of Insulin Treatment Appraisal Scale (ITAS) and Barriers to Insulin Treatment Questionnaire (BITQ) scores of Torres Strait Islanders with diabetes, by baseline characteristics*

Baseline characteristics	ITAS scores				BITQ scores		
	No.	Mean	(95% CI)	P value	Mean	(95% CI)	P value
Total	29	66.3	(62.5–70.1)		84.9	(79.7–90.1)	
Gender							
Male	15	66.2	(60.1–72.3)	0.967	87.4	(81.9–92.9)	0.320
Female	14	66.4	(61.1–71.6)		82.2	(72.4–92.0)	
Age group							
≤49 years	11	61.2	(53.6–68.7)	0.028	81.6	(70.1–93.1)	0.329
>50 years	18	69.4	(65.5–73.3)		86.9	(81.2–92.5)	
BMI category							
Healthy BMI (18.5–24.9)	1	–	–		–	–	
Overweight BMI (25.0–29.9)	5	65.4	(51.4–79.4)	0.680	77.4	(60.1–94.7)	0.424
Obese BMI (30+)	23	66.1	(61.8–70.4)		86.5	(80.5–92.5)	
Employment							
Employed fulltime	9	67.1	(59.6–74.6)	0.127	85.3	(74.1–96.5)	0.345
Employed part-time/casual	5	58.2	(41.4–75.0)		76.8	(51.9–101.7)	
Not currently employed	15	68.5	(64.1–72.8)		87.3	(81.4–93.3)	
Education							
Year 12 not completed	16	71.5	(68.6–74.4)	0.001	89.3	(84.1–94.4)	0.058
Year 12 completed and higher	13	59.8	(53.5–66.2)		79.5	(69.6–89.5)	
Income							
$20 000–$59 999	17	66.4	(60.9–71.8)	0.961	85.9	(79.8–91.9)	0.655
$>60 000	12	66.2	(60.3–72.0)		83.5	(72.9–94.1)	
Smoking							
Nonsmoking	18	68.2	(64.1–72.3)	0.195	86.7	(80.3–93.0)	0.386
Yes smoking	11	63.2	(55.1–71.2)		82.0	(71.5–92.5)	
Alcohol							
No alcohol	16	69.1	(64.9–73.3)	0.086	87.3	(81.7–92.8)	0.317
Alcohol	13	62.8	(55.9–69.6)		82.0	(71.6–92.4)	

TABLE 4: *Barriers to Insulin Treatment Questionnaire (BITQ), item content, mean score and distribution of responses to individual items, mean subscales and total BITQ scores*

Barriers to Insulin Treatment Questionnaire (BITQ) (1–10)	Torres Strait n = 29			Petrak *et al.* (2007) n = 448	
	Mean	(sd)	A/SA%	Mean	(sd)
Scale 1: 'Fear of injections and self-testing'	5.25	(2.56)		3.19	(2.78)
1. I am afraid of the pain when injecting insulin	5.69	(2.70)	51.7	3.62	(3.33)
2. Besides the pain, I am just afraid of injections	5.69	(3.00)	62.1	3.58	(3.50)
3. I am afraid of the pain during regular blood-sugar checks	4.38	(2.38)	27.6	2.37	(2.64)
Scale 2: 'Expectations regarding positive insulin-related outcomes'	4.57	(1.93)		7.36	(1.87)
^4. Insulin works better than pills	3.97	(2.51)	20.7	8.19	(2.41)
^5. People who get insulin feel better	4.90	(2.35)	27.6	7.42	(2.46)
^6. Insulin can reliably prevent long-term complications due to diabetes	4.86	(1.87)	20.7	6.46	(2.38)
Scale 3: 'Expected hardship from insulin therapy'	5.30	(1.36)		4.20	(2.74)
7. I just do not have enough time for regular doses of insulin	5.48	(2.18)	27.6	3.30	(3.04)
8. I cannot pay as close attention to my diet as insulin treatment requires	5.17	(2.12)	17.2	4.73	(3.25)
9. I cannot organise my day as carefully as insulin treatment requires	5.24	(1.75)	13.8	4.58	(3.38)
Scale 4: 'Stigmatisation by insulin injections'	6.47	(1.70)		4.30	(2.52)
10. Injections in public are embarrassing to me. Pills are more discreet	7.17	(2.48)	72.4	5.45	(3.78)
11. Regular insulin treatment causes feelings of dependence	5.62	(1.86)	20.7	5.06	(3.46)
12. When people inject insulin, it makes them feel like drug addicts	6.62	(2.44)	65.5	2.38	(2.70)
Scale 5: 'Fear of hypoglycaemia'	6.79	(2.09)		6.21	(2.73)
13. Regarding insulin overdose, I am afraid of the unpleasant accompanying symptoms	6.90	(2.14)	58.6	6.61	(2.92)
14. Regarding insulin overdose, I have concerns about possible permanent damage to my health	6.69	(2.09)	55.2	5.81	(3.11)
Total (sum score 14 items, 3 negatively recoded)	84.90	(13.79)			
Average of total scores	6.06	(0.99)		4.17	(1.55)

Scoring: 1 = Strongly Disagree, 10 = Strongly Agree. (sd), standard deviation; A/SA, Agree/Strongly Agree (7–10); ^, positive BITQ items. Scales are the sum of all responses divided by number of questions. Average of total score is the sum of all scores divided by the total number of items in the scale.

and 7.9 years, respectively). Self-reported knowledge of treatment and satisfaction with care coordination was similar between groups (Table 2).

Of the 29 insulin-naïve participants with poor control who completed the ITAS and BITQ, ITAS scores were significantly higher among participants aged 50 years and over (ITAS = 69.4, 95% CI: 65.5–73.3) compared to all younger participants (ITAS = 61.2, 95% CI: 53.6–68.7, P = 0.028). Similarly, participants who had not completed year 12 had significantly higher ITAS scores (ITAS = 71.5, 95% CI: 68.6–74.4) compared to those with higher levels of education (ITAS = 59.8, 95% CI 53.5–66.2, P = 0.001). There was a similar relationship between education and BITQ scores; however, the differences only just approached significance, t(1.98), P = 0.058 (Table 3).

On the BTIQ scale, mean responses were higher for scale 1 ('fear of injections', M = 5.25, 95% CI: 4.28–6.23); lower for scale 2 ('positive expectations regarding insulin treatment', M = 4.57 95% CI: 3.84–5.31) and higher for scale 4 ('stigmatisation from injections', M = 6.47, 95% CI: 5.83–7.12), in comparison with the

TABLE 5: *Insulin Treatment Appraisal Scale (ITAS), item content, mean score and distribution of responses to individual items, mean subscales and total ITAS scores*

Insulin Treatment Appraisal Scale (ITAS) (1–5)	Torres Strait n = 29			Snoek et al. (2007) n = 146			Truscott et al. (2014) n = 499		
	Mean	(sd)	A/SA%	Mean	(sd)	A/SA%	Mean	(sd)	A/SA%
1. Taking insulin means I have failed to manage my diabetes with diet and tablets.	3.8	(0.8)	75.9	3.4	(1.40)	54.0	3.5	(1.30)	58.3
2. Taking insulin means my diabetes has become much worse.	3.8	(0.8)	75.9	3.9	(1.60)	73.0	4.0	(1.00)	80.2
^3. Taking insulin helps to prevent complications of diabetes.	3.2	(0.8)	37.9	3.8	(1.10)	62.0	3.9	(1.00)	76.4
4. Taking insulin means other people see me as a sicker person.	4.1	(0.9)	86.2	3.2	(1.30)	41.0	3.3	(1.10)	46.3
5. Taking insulin makes life less flexible.	3.2	(0.6)	34.5	3.8	(1.10)	70.0	3.6	(1.10)	58.7
6. I'm afraid of injecting myself with a needle.	3.3	(1.2)	58.6	3.1	(1.50)	47.0	3.3	(1.40)	47.9
7. Taking insulin increases the risk of low blood glucose levels (hypoglycaemia).	3.3	(0.8)	41.4	3.1	(1.10)	52.0	3.4	(1.00)	46.5
^8. Taking insulin helps to improve my health.	3.1	(1.0)	37.9	3.6	(1.00)	53.0	3.8	(0.08)	67.7
9. Insulin causes weight gain.	3.0	(0.9)	34.5	3.1	(0.90)	23.0	3.1	(0.08)	18.2
10. Managing insulin injections takes a lot of time and energy.	3.1	(0.9)	27.6	3.6	(1.10)	61.0	3.3	(1.00)	40.9
11. Taking insulin means I have to give up activities I enjoy.	3.1	(0.8)	34.5	2.6	(1.10)	19.0	2.7	(1.00)	16.8
12. Taking insulin means my health will deteriorate.	3.3	(1.2)	62.1	2.7	(1.10)	23.0	2.8	(1.00)	18.6
13. Injecting insulin is embarrassing.	3.7	(1.2)	79.3	2.6	(1.30)	23.0	2.7	(1.10)	21.6
14. Injecting insulin is painful.	3.3	(1.3)	65.5	3.3	(1.20)	43.0	3.1	(1.00)	32.1
15. It is difficult to inject the right amount of insulin correctly at the right time every day.	3.2	(1.0)	44.8	3.2	(1.20)	40.0	3.0	(0.90)	23.2
16. Taking insulin makes it more difficult to fulfil my responsibilities (at work, at home).	3.1	(0.9)	34.5	2.9	(1.20)	27.0	2.8	(0.90)	17.8
^17. Taking insulin helps to maintain good control of blood glucose.	3.2	(0.7)	27.6	3.7	(1.00)	59.0	3.9	(0.80)	74.7
18. Being on insulin causes family and friends to be more concerned about me.	4.3	(0.8)	86.2	3.5	(1.10)	55.0	3.6	(0.90)	57.7
^19. Taking insulin helps to improve my energy level.	3.1	(0.9)	31.0	3.2	(0.70)	25.0	3.3	(0.70)	30.9
20. Taking insulin makes me more dependent on my doctor	3.1	(0.8)	27.6	3.4	(1.10)	40.0	3.4	(0.90)	47.3
Total ITAS (sum score 20 items, 4 negatively recoded)	66.3	(9.9)		61.0	(2.80)		60.7	(10.10)	
Total positive items ITAS	12.5	(2.9)		14.0	(2.90)		14.9	(2.40)	
Total negative items ITAS	54.8	(7.5)		55.0	(2.70)		51.6	(10.20)	

Scoring: 1 = Strongly Disagree, 5 = Strongly Agree. (sd), standard deviation; A/SA, Agree/Strongly Agree (4–5); ^, positive ITAS items.

same scales from a recent German study. The derived confidence intervals from the German study for the three scales were: *M* = 3.19, 95% CI: 2.93–3.45; *M* = 7.36, 95% CI: 7.19–7.53; and *M* = 4.30, 95% CI: 4.07–4.53, respectively, and none of these intervals overlapped with the current study (Table 4).

Responses to the 'positive' ITAS scales ('taking insulin prevents complications; improves glucose control and improves health') were generally low with less than 40% agreeing or strongly agreeing. Responses to the negative scales were generally high (more than 60% agree or strongly agree) especially for 'others see

me as a sicker person', 'injecting insulin is embarrassing' and 'painful', in comparison with a recent report from an Australian group (Table 5).

Conclusion

This study of a group of high-risk Torres Strait Islanders with poorly controlled diabetes and who were not taking insulin found mostly negative perceptions of insulin which could be significant barriers to better glycaemic management. The few published studies in other groups using these instruments showed much lower negative perceptions and much higher positive perceptions than the Torres Strait Islanders.

Limitations to this study include a very small study sample, although 100% of those approached agreed to participate (29 out of 30 completed the questionnaires, one participant died prior to the interview) suggesting that the responses are representative of this population. Another limitation is the lack of validation of these instruments in this population, where English is not the first language for many. However, the survey was administered by one of the investigators who is from these islands and who speaks fluent Creole.

These results, when compared to reports from other populations including in Australia, suggest that perceived barriers to insulin treatment are high in this population, especially among those who are older with fewer years of formal education. Improving the uptake of insulin for those who could benefit from it will require better communication between service providers and clients, including more time taken to explore these issues in depth and taking account of local cultural contexts and beliefs.

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Author contributions

ST – prepared the manuscript, developed the research design and assisted the supervisory team. Undertook initial community engagement, patient recruitment and data collection. RM – principal supervisor of (ST) and contributed to the development of the research design, project proposal and manuscript development. FT – conducted the statistical analysis and manuscript development.

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