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Title: Factors associated with the increased risk of dementia found in the Torres Strait

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Abstract

Objective

To identify specific risk factors for dementia in the Torres Strait.

Methods

This research was conducted as part of a cross-sectional dementia prevalence study conducted in the Torres Strait. Participants underwent a comprehensive health assessment, where data on risk factors were collected, and a Geriatrician assessment, which was used to establish dementia diagnoses.

Results

A total of 276 Torres Strait residents aged between 45 and 93 participated in the study. Cerebrovascular disease, chronic kidney disease, and older age were the most significant risk factors in this population. Once adjusted for age, cerebrovascular disease, chronic kidney disease, diabetes, low education, and problems with mobility and incontinence were significantly associated with dementia.

Conclusion

Reducing dementia risk in the Torres Strait requires multifactorial interventions to address potentially modifiable risk factors with a particular focus on addressing the development of chronic midlife diseases.

Key words

Ageing; dementia; Indigenous People; chronic disease

Introduction

In 2020, there were around 50 million people globally living with dementia, with this number expected to exceed 152 million by 2050[1]. At an annual cost of US$818 billion worldwide, dementia has a devastating impact on those affected, their families and carers, as well as society more broadly[2]. While increasing age and genetic factors, such as the presence of the APOE *ε4* allele, are known risk factors for dementia[3], evidence is emerging that potentially modifiable midlife chronic diseases such as hypertension, dyslipidaemia, and diabetes also contribute to dementia risk[2]. Other potentially modifiable risk factors include smoking, obesity and late life depression, while possible protective factors include higher levels of education, physical activity and social integration[2]. As up to forty percent of cases of dementia may be reduced or delayed by addressing modifiable risk factors, particularly in mid-life[2], such interventions have the potential to significantly reduce the individual, social, and economic impacts of dementia.

Rates of dementia within Australian Aboriginal communities are three to five times higher than the general population[4,5]. With the population of Aboriginal and Torres Strait Islander people over 65 years projected to almost double by 2026[6], dementia rates are set to increase markedly in these communities. Within remote Aboriginal communities in the Kimberley region of Western Australia, dementia risk was associated with older age, male gender, absence of formal education, current smoking, stroke, epilepsy, head injury, poor mobility, falls, and incontinence[7]. Longitudinally, age and head injury remained significant dementia risk factors with stroke, non-aspirin analgesics, lower BMI, and higher systolic BP also associated with cognitive decline[8]. In a study in urban and regional Aboriginal communities in NSW, age, head injury and stroke were significant dementia risk factors, together with social and life span risk factors, such as unskilled work and childhood trauma[9].

Torres Strait Islander people are a culturally distinct First Nations population in Australia, traditionally of Melanesian origin[10]. Whilst an increased risk of dementia has been reported in the Torres Strait, with rates almost three times higher than the general population being reported[11], it is not known if these communities share the pattern of risk factors for dementia seen in Aboriginal communities. Risk factors may vary due to diversity in lifestyles including differences in diet, health, access to medical and health services, and other cultural, geographical, and demographic differences. The aim of this study was to identify specific risk factors associated with the increased risk of dementia identified in Torres Strait adults aged 45 and over, including those that may be suitable targets for future interventions to reduce dementia risk and improve overall health outcomes and quality of life.

Ethical Considerations

The study was co-designed and conducted in partnership with the Post-Acute, Rehabilitation and Aged Care Service on Thursday Island. Ethics approval was obtained from Queensland Health (HREC/13/QCH/129-878) and James Cook University (H5495) prior to commencement of the study.

Materials and Methods

Study Design

This research was part of a cross-sectional dementia prevalence study conducted in the Torres Strait and Northern Peninsula Area between May 2015 and February 2018. The study used similar methodology to the Kimberley study[5] so comparisons could be made across studies.

Demographic, lifestyle, and clinical data were collected from participants using the Kimberley Cognitive Assessment Tool (KICA)[12] and screening questionnaires assessing common Geriatric syndromes. Screening questionnaires were based on commonly used tools that demonstrated good face and inter-rater reliability in the Kimberley study[5] and following minor modifications to maintain cultural appropriateness, were well accepted in a pilot study in the Torres Strait[13]. Participants also underwent a comprehensive dementia assessment with a Geriatrician, with de-identified data later reviewed by a panel comprising Geriatricians and an Older Person Psychiatrist to obtain consensus diagnoses. Participants were diagnosed using criteria from the Diagnostic and Statistical Manual for Mental Disorders, 4th Edition (DSM IV-TR)[14], with dementia subtypes specified where possible. Methodology and results of the prevalence study have been reported elsewhere[11].

Materials

The Kimberley Indigenous Cognitive Assessment (KICA) is a culturally appropriate dementia assessment tool, which collects demographic and clinical information (social, medical, smoking/alcohol history, depression and anxiety), assesses cognitive and functional status, and obtains informant reports[15].

The Elderly Fall Screening Test (EFST) is a 5-item screening questionnaire designed to identify falls risk in community dwelling adults based on the number of falls, and near falls in the past year, as well as gait and walking speed. Scores of 2 and above are consistent with high falls risk[16].

The Brief Pain Inventory (BPI) short form assesses the presence and severity of pain and its functional impact, with higher scores indicating greater severity and functional impact [17].

The Modified ICIQ Continence Questionnaire (ICIQ) comprises four questions assessing symptoms and impact of urinary incontinence, with scores of 2 and above identifying those needing referral[18].

The KICA-dep measures common symptoms of depression in Aboriginal and Torres Strait communities, with a cut point of 7/8 associated with 78% sensitivity and 82% specificity for the diagnosis of a depressive disorder[19].

The Geriatric Anxiety Inventory (GAI) short form is a 5-item reliable and valid screening instrument for anxiety in older adults. A cut point of 2/3 correctly classifies 86% of patients with generalised anxiety, with a sensitivity of 75% and specificity of 87%[20].

Participants

Participants included Aboriginal and Torres Strait Islander residents living in the Torres Strait and Northern Peninsula Area aged 45 years and over. There were no other specific inclusion or exclusion criteria as the aim of the dementia prevalence study was to assess as many residents as possible. Further details about the participants and recruitment methodology are reported elsewhere[11].

Data Analysis

Diagnostic information from Geriatrician assessments was used to classify participants into two groups -dementia or no dementia- for the purposes of analyses. Choice of risk factors was guided by the literature and risks identified in Aboriginal communities. Risk factors evaluated included demographic (age, gender, education), lifestyle (past and present smoking and alcohol history), clinical (head injury involving loss of consciousness, epilepsy, depression, hearing impairment, and systolic blood pressure) and vascular (heart disease, hypertension, diabetes, dyslipidaemia, chronic kidney disease, and cerebrovascular disease) variables. Other associated problems of ageing (falls risk, pain, incontinence, anxiety, mobility, number of medications, and polypharmacy) were also evaluated. Number of vascular risk factors was measured as a continuous variable and defined as the cumulative presence of smoking (past and current) and individual vascular risk factors. Preliminary analyses of data indicated that a history of cerebrovascular disease was a significant risk factor for dementia, irrespective of the number of other vascular risk factors. To examine the cumulative effect of vascular risk factors, separate from the overriding effect of cerebrovascular disease, sub-analyses were also undertaken after removing 19 participants who had a history of cerebrovascular disease.

Data were first examined for missing values. In terms of demographics, 8% of participants were missing information for education; and 1.8%-10.5% for health behaviours (e.g. current alcohol 3.3%, past alcohol use 4.0%, current smoker 3.3%, past smoker 7.7%, head injury 10.6%, and medication 8.4%). Data were complete for vascular risk factors from the Geriatrician assessment while test scores had substantial missing information (e.g. BPI 9.9%, EFST 16.8%, ICIQ 9.5%, GAI SF 32.8% and KICA-dep 13.9%). Missing data was also high for systolic blood pressure (47.4%). Continuous measures were examined for normality with age, systolic blood pressure, number of medications and vascular risk factors the only normally distributed variables.

Interrelationships between variables were examined to identify potentially confounding variables. Associations between demographic, clinical and lifestyle factors and dementia were then examined using independent samples t-tests, Mann-Whitney U tests, and Pearson chi-square tests for independence (see Table 1).

Following preliminary analyses, univariate and multivariate logistic regression models were used to examine the association between dementia and risk factors variables. As univariate and confounder analyses revealed age was related to dementia risk and many other study variables, in the first multivariate model, risk factors were adjusted for age. To control for all demographic variables, each risk factor was then adjusted for age, gender and education in a second model. The results of unadjusted and multivariate logistic regressions are reported in Table 2.

Additional modelling was undertaken using a backward approach. Specifically, all risk factors that had statistical or trend significance (i.e. $p<0.05$) at a univariate logistic regression level were entered into a 'full model'. Variables with $p>0.1$ were then removed, leaving a subset of variables for the final model. Results are reported in Table 3.

Variables with substantial amounts of missing data were excluded from multivariate analyses (e.g. GAI SF). Similarly, categorical variables with less than 10 dementia cases in the levels of the values were excluded from multivariate modelling (e.g. current alcohol consumption, recent fall, low mood, head injury and epilepsy, Table 1). For modelling purposes, highest education was dichotomised into Primary School and High School or further, as there were very few cases of dementia in certain levels of education. All analyses were undertaken using SPSS Statistics for Windows, Version 26 (SPSS Inc).

Results

Participants

A total of 276 participants were recruited from all populated communities in the Torres Strait and Northern Peninsula Area. Dementia diagnosis data were not available for two participants, who were excluded from analyses, reducing the final sample to 274 participants. Of these, 88% were of Torres Strait Islander descent, 4% of Aboriginal descent, and 8% of Aboriginal and Torres Strait Islander descent. Mean age of the sample was 65.1 (SD10.8, range 45-93) and 34.3% were male. All had some formal education, and 95% of participants spoke English as either a primary or secondary language (data not tabled).

Associations between risk factors

There was considerable overlap between study variables (data not tabled). Older age was significantly associated with less education ($p<0.001$), polypharmacy ($p=0.014$), hypertension

(p=0.004), dyslipidaemia (p=0.021), heart disease (p=0.002), kidney disease (p=0.001), hearing difficulties (p=0.001), a higher number of medications (p=0.002) and number of vascular risk factors (p<0.001), as well as an increased falls risk, as measured by EFST scores (p<0.001). Participants who consumed alcohol currently and previously were younger than those who did not (p<0.001 respectively). Age was negatively associated with scores on the BPI (p=0.055), GAI SF (p=0.027) and KICA-dep (p<0.023) (Spearman's Rho -0.122 to -0.203). Men were more likely to report current (p=0.004) and previous (p<0.001) alcohol consumption and have a hearing impairment (p<0.001) compared to women, who reported more incontinence problems (p=0.026). A greater proportion of females had a post school education compared to males (p=.017).

Risk Factors for Dementia

There were 39 (14.2%) participants diagnosed with dementia according to DSM IV-TR criteria. Participants with dementia were significantly older (M = 74.97 years) than those without dementia (M = 63.4) (t(272) = -6.67, p = <0.001, g=1.15) (Table 1) and had a lower proportion of post school education (14.8% and 40.9% respectively, p=0.062). Those with dementia were significantly less likely to consume alcohol currently (5.6%) compared to those without dementia (28.8%, X^2 (1, N = 265) = 7.65, p= 0.006, φ_c =.183). Previous alcohol consumption was significantly lower in the dementia group (48.6%) compared to participants without dementia (75%, X^2 (1, N = 263) = 9.14, p=0 .003, φ_c =.20).

Among participants with dementia, the proportion with a hearing impairment or chronic kidney disease was more than double that of people without dementia (X^2 (1, N = 271) = 5.54, p=0.019, φ_c =.16) and (X^2 (1, N = 274) = 8.29, p <0.004, φ_c =.187). Dyslipidaemia (X^2 (1, N = 274) = 4.17, p <0.041, φ_c =.134), poor mobility (X^2 (1, N = 254) = 8.41, p <0.004, φ_c =.195) and number of medications (t(249) = .-2.281, p = 0.026, g=0.33) were all associated with dementia. The number of vascular risk factors was significantly higher for participants with dementia (M = 3.59) compared to those without dementia (M = 2.7) (t(272) = -3.65, p = <0.001, g=0.63). The presence of cerebrovascular disease was ten times higher among people with dementia (30.8%) compared to participants without dementia (3%) (X^2 (1, N = 274) = 35.84, p <0.001, φ_c =.382).

People with dementia had significantly higher EFST scores (Mdn=2) and lower BPI (Mdn =0) scores compared to people without dementia (Mdns =1 and 3.5 respectively). Median scores on the other tests were comparable between the groups.

Logistic Regression Analyses

Age was a significant predictor of dementia likelihood (OR=1.18, 95% CI 1.08-1.16, p<0.001) (Table 2). After adjusting for this variable, people with a history of chronic kidney disease (OR=2.31, 95%CI 1.04, 5.12, p=0.040), cerebrovascular disease (OR=27.67, 95%CI 9.19-93.50, p<0.001) and a higher ICIQ score (OR=1.30, 95%CI 1.03-1.46, p=0.019) were more likely to be diagnosed with dementia. Cerebrovascular disease and ICIQ remained significantly associated with dementia after adjusting for age, education and gender. Lower education was also a risk factor for dementia. However, there were insufficient cell sizes for multivariate analyses and education dichotomised was not significant after adjusting for age.

Variables with univariate logistic regression trend significance in Table 1 (i.e. p<=0.1) were entered into a full model. After backwards removal of all non-significant covariates, age, cerebrovascular disease, and chronic kidney disease remained the three significant risk factors for dementia (Table 3). Although cerebrovascular disease was a pronounced risk factor for dementia, there were only 19 participants with a history of this disease. When these participants were removed from the full model and the backwards process repeated, age (p<0.001) and chronic kidney disease (p=0.054) remained important predictors of dementia.

Discussion

The most significant risk factors for dementia in this study of older adults living in the Torres Strait were a history of cerebrovascular disease, chronic kidney disease, and older age. These are known risk factors within the wider community, however, for cerebrovascular disease in particular, the contribution to all cause dementia was considerably higher than the twofold risk reported in the wider community[21,22].

The impact of vascular risk factors in this study highlights the impact of midlife chronic disease on dementia risk seen in the Torres Strait. The high rates of chronic disease identified in this study were consistent with previous research[23] and were much higher than the wider community [24]. These risk factors are potentially modifiable through lifestyle interventions such as diet and activity, smoking cessation, and optimal management of blood pressure and

blood sugar levels. Results therefore highlight the need for preventative measures and targeted interventions early in life to prevent the development of chronic diseases in midlife.

Problems of ageing, including mobility, incontinence, and polypharmacy were also associated with dementia risk, highlighting the challenges of comorbidities that can contribute to excess disability.

Several risk factors identified in this study including stroke, older age, lower education, and associated problems of ageing such as mobility and incontinence were consistent with findings in Aboriginal communities[7,9]. Commonalities between studies likely reflect the impact of health inequalities and socioeconomic disadvantage across the lifespan that contribute to development of midlife chronic diseases that in turn, increases dementia risk. However, head injury, which was identified as being a significant risk in Aboriginal communities[5], was not associated with an increased risk in the Torres Strait. Rates of head injury were higher in the previous studies, in 51% of Kimberley participants[5] and 29% of NSW participants[9], compared to 18% in this study. It may be that different mechanisms of injury and number and severity of injury influenced results. Nevertheless, differences underscore how exposure to specific risk factors leads to distinct patterns of risk within communities.

This study has several limitations. The cross-sectional nature of the study limits the conclusions able to be drawn and longitudinal analyses are planned. The small sample size limited interpretation of certain associations. For example, at a univariate level, post school education appeared protective against dementia when compared to primary school education. However, due to small cell sizes, this could not be explored after adjusting. Similarly, although diabetes and dyslipidaemia remained as risk factors after adjusting for age, their significance was only at 'trend' levels and their odds ratios had wide confidence intervals. The ability to explore the role of epilepsy or current alcohol use on dementia risk was also limited by the small sample size. The very wide confidence intervals around cerebrovascular disease also reflect the effect a small sample size. The lack of association between several known vascular risk factors and dementia may reflect how variables were measured, which may have obscured potential associations and masked the impact of some chronic diseases on dementia risk. For example, as high rates of polypharmacy found in this study suggest many chronic diseases are being medically managed, abnormal biological indices (e.g. elevated

HbA1c levels) may be a better way of measuring impact of these chronic diseases on dementia risk.

There was no association between dementia risk and late-life depression in this study. While low scores are consistent with a previous study showing low rates of depression in people with diabetes in the Torres Strait[28], it is possible that modified measures are required for the Torres Strait. There was also no association between dementia risk and late-life anxiety, although in this study, women reported significantly higher rates of anxiety than men. To our knowledge, no studies of late-life anxiety have been undertaken in Australian Indigenous populations, despite studies examining mental health in this group[29]. Results highlight the need for further investigation into the nature of late-life mood and anxiety disorders and further evaluation of the cultural appropriateness of existing psychological tools.

Overall, results show that reducing dementia risk in the Torres Strait requires multifactorial interventions that address potentially modifiable risk factors, with a particular focus on addressing the development of chronic disease in midlife. Studies have shown that health interventions that are culturally appropriate and co-designed with Aboriginal and Torres Strait communities are more acceptable and have better outcomes[25,26].To adequately address the range of risk factors seen in Aboriginal and Torres Strait Islander communities, healthy ageing or dementia risk reduction interventions need to be co-designed to be holistic and multifactorial, encompassing physical, cognitive, socioemotional wellbeing, and educational components, and tailored for the community[27]. Further study is needed to investigate the role of protective factors that may modify dementia risk in these communities.

Data Sharing and Data Accessibility

Research data are not available

Statement of conflicts of interest

The authors declare no conflicts of interest

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Practice Impact Statement

Results show that reducing dementia risk in the Torres Strait requires multifactorial interventions that address potentially modifiable risk factors. To address the range of risk factors seen in Aboriginal and Torres Strait Islander communities, healthy ageing or dementia risk reduction interventions need to be co-designed to be holistic and multifactorial, encompassing physical, cognitive, socioemotional wellbeing, and educational components, and tailored for the community.

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Table 1: Associations between demographic, clinical and lifestyle factors and dementia within a sample of Indigenous residents of the Torres Strait and Northern Peninsula Area (N=274), 2015-2018

	Dementia n=39[d] n (%)	**No Dementia n= 235 n (%)**	**p value[a]**
Demographic Characteristics			
Age [b+]	74.97 (8.6)	63.4 (10.3)	<0.001
Gender			
Male	14 (35.9)	80 (34.8)	0.965
Female	25 (64.1)	155 (66.0)	
Education			
Primary	13 (48.1)	69 (30.7)	0.062
Year 10	8 (29.6)	48 (21.3)	
Year 12	2 (7.4)	16 (7.1)	
Post school	4 (14.8)	92 (40.9)	
Self-reported behaviours			
Currently drinks alcohol	2 (5.6)	66 (28.8)	0.006
Previously drank alcohol	17 (48.6)	171 (75.0)	0.003
Current smoker	4 (11.1)	37 (16.2)	0.596
Past smoker	19 (65.5)	161 (71.9)	0.622
Self-reported medical history			
Poor mobility	17 (54.8)	61 (27.4)	0.004
Head Injury[e]	4 (15.4)	40 (18.3)	0.927
Medical History from Geriatrician Assessment			
Hearing impairment	12 (31.6)	34 (14.6)	0.019
Number of medications [b+]	5.18 (2.3)	4.22 (2.96)	0.026
Polypharmacy	24 (63.2)	100 (46.9)	0.096
Number vascular risk factors [b+]	3.59 (1.35)	2.70 (1.4)	<0.001
Epilepsy	2 (5.1)	1 (0.4)	0.075
Diabetes	30 (76.9)	141 (60.0)	0.065
Dyslipidaemia	23 (59.0)	94 (40.0)	0.041
Chronic Kidney Disease	15 (38.5)	40 (17.0)	0.004
Heart disease	10 (25.6)	39 (16.6)	0.254

Cerebrovascular Disease	12 (30.8)	7 (3.0)	<0.001
Hypertension	28 (71.8)	149 (63.4)	0.404
Systolic Blood Pressure, mm Hg [b+]	125.2 (12)	129.5 (16.87)	0.285
Diastolic Blood Pressure, mm Hg [b+]	68.5 (11.2)	70.9 (11.4)	0.395
Test scores			
BPI total [c+]	0 (0-4.5)	3.5 (0-7)	0.031
EFST total [c+]	2 (0.75-3.25)	1 (0-2)	0.012
ICIQ total [c+]	0 (0-3.75)	0 (0-2)	0.615
KICA-dep total [c+]	2 (0-4)	1 (0-3.25)	0.763
GAI SF total [c+]	0 (0-2)	0 (0-1.5)	0.869

*p<.05

a=Chi Square test for independence

b= T-Test for independent samples

c= Mann-Whitney U Test for independent samples

+= Continuous variable, Mean (Standard Deviation, SD) reported for normally distributed variables and Median (Interquartile Range, IQR) for not normally distributed variables

[d] Dementia diagnoses included Dementia Not Otherwise Specified (n=18), Dementia of the Alzheimer's Type (n=14), Vascular Dementia (n=9), dementia due to other medical conditions (n=3), and dementia due to multiple aetiologies (n=1).

[e] Reasons for head injury included: Assault (n=16); Falls (n=10); Accident (n=8); Motor vehicle accident (n=4); Sport-related (n=3); Electrocution (n=1); and Not specified (n=2)

Self-reported medical and behavioural data obtained from the KICA tool

Vascular risk factors were defined as smoking (past and current), diabetes, hypertension, dyslipidaemia, heart disease, cerebrovascular disease or chronic kidney disease.

Polypharmacy = 5 or more prescription medications

BPI = Brief pain inventory

EFST = Elderly Fall Screening Test

ICIQ = incontinence questionnaire

KICA-dep = Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale

GAI SF= Geriatric Anxiety Inventory short form

Table 2: Univariate and multivariate logistic regressions examining selected study variables for association with dementia, among Indigenous residents of the Torres Strait and Northern Peninsula Area, 2015-2018

Variable	Univariate analysis	p value	Model 1 – Age adjusted OR (95% CI)	p value	Model 2 – Age, Gender and Education adjusted OR (95% CI)	p value
Demographic Characteristics						
Age	1.18 (1.08, 1.16)	0.000*			1.12 (1.06, 1.17)	0.000*
Gender	1.09 (0.54, 2.20)	0.821	1.11 (0.51, 2.43)	0.786	0.82 (0.33, 2.02)	0.669
Education						
Primary	4.33 (1.35, 13.87)	0.013*	2.07 (0.59, 7.18)	0.252	2.12 (0.61, 7.44)	0.239
Year 10	3.84 (1.10, 13.38)	0.035*	3.34 (0.87, 12.60)	0.075	3.37 (0.89, 12.76)	0.074
Year 12	2.88 (0.486, 17.02)	0.244	3.20 (0.45, 21.49)	0.231	3.07 (0.45, 20.88)	0.252
Post school	1.00 (Ref)		1.00 (Ref)	1.00 (Ref		
Education Dichotomised						
Primary	2.10 (0.94, 4.70)	0.071	1.02 (0.42, 2.48)	0.966	1.05 (0.43, 2.57)	0.919
Year 10 or further	1.00 (Ref)		1.00 (Ref)		1.00 (Ref)	
Self-reported behaviours						
Currently drinks	0.15 (0.03, 0.62)	0.009*	0.24 (0.05, 1.08)	0.063	0.29 (0.06, 1.35)	0.116
Previously drank	0.32 (0.15, 0.65)	0.002*	0.51 (1.07, 1.16)	0.099	0.49 (0.18, 1.33)	0.488
Current smoker	0.45 (0.22, 1.94)	0.439	0.76 (0.23, 2.44)	0.639	0.71 (0.19, 2.68)	0.615
Past smoker	0.74 (0.33, 1.69)	0.478	0.96 (0.39, 2.37)	0.941	0.86 (0.33, 2.25)	0.757
Self-reported medical history						
Poor mobility	3.25 (1.50, 6.94)	0.003*	1.89 (0.81, 4.41)	0.140	1.75 (0.70, 4.37)	0.231
Head injury	0.081 (0.26, 2.49)	0.718	1.09 (0.33, 3.59)	0.882	0.87 (0.23, 3.32)	0.842
Medical History from Geriatrician Assessment						
Hearing impair	2.70 (1.25, 5.86)	0.012*	0.69 (0.71, 4.03)	0.235	1.60 (0.56, 4.53)	0.379
Number of medications	1.12 (0.99, 1.26)	0.058	1.09 (0.95, 1.26)	0.182	1.11 (0.94, 1.31)	0.208
Vascular risk	1.33 (0.99, 1.79)	0.055	1.30 (0.93, 1.80)	0.125	1.33 (0.88, 1.99)	0.174

factors#						
Diabetes	2.22 (1.01, 4.89)	0.047*	2.17 (0.92, 5.15)	0.076	2.14 (0.78, 5.82)	0.138
Dyslipidaemia	2.16 (1.08, 4.30)	0.029*	2.07 (0.97, 4.41)	0.060	2.13 (0.88, 5.12)	0.093
Chronic Kidney Disease	3.04 (1.47, 6.32)	0.003*	2.31 (1.04, 5.12)	0.040*	1.79 (0.68, 4.76)	0.242
Heart disease	1.73 (0.78, 3.84)	0.176	1.09 (0.45, 2.61)	0.851	0.83 (0.27, 2.56)	0.749
Cerebrovascular Disease	14.47 (5.25, 39.90)	0.000*	27.67 (9.19, 93.50)	0.000*	46.62 (10.18, 213.52)	0.000*
Hypertension	1.47 (0.69, 3.10)	0.312	1.09 (0.48, 2.50)	0.828	1.20 (0.45, 3.23)	0.713
Systolic Blood Pressure (mm Hg	0.98 (0.95, 1.01)	0.284	0.98 (0.95, 1.01)	0.248	0.99 (0.95, 1.03)	0.687
B+						
Test scores						
BPI total	0.88 (0.79, 0.98)	0.027*	0.91 (0.80, 1.03)	0.131	0.91 (0.80, 1.04)	0.156
EFST total	1.28 (1.02, 1.60)	0.033*	1.18 (0.91, 1.52)	0.211	1.15 (0.86, 1.52)	0.345
ICIQ total	1.18 (1.01, 1.38)	0.035*	1.30 (1.03, 1.46)	0.019*	1.23 (1.01, 1.49)	0.041*
KICA-dep total	0.97 (0.84, 1.17)	0.676	1.05 (0.91, 1.23)	0.489	1.03 (0.87, 1.21)	0.738

*p<.05

Health and behavioural measures based on self-report data obtained from the KICA tool

Vascular risk factors were defined as self-reported smoking, diabetes, hypertension, dyslipidaemia, heart disease, cerebrovascular disease or chronic kidney disease.

BPI = Brief pain inventory

EFST = Elderly Fall Screening Test

ICIQ = incontinence questionnaire

KICA-DEP= KICA-dep = Kimberley Indigenous Cognitive Assessment of Depression (KICA-dep) scale

GAI SF= Geriatric Anxiety Inventory short form

= Number of vascular risk factors excludes n=19 participants who had a history of CVD

Table 3: Multivariate logistic regression for all-cause dementia among Indigenous residents of the Torres Strait and Northern Peninsula Area, 2015-2018

Variable	OR (95% CI)	p value
All participants		
Age	1.14 (1.09, 1.20)	0.000*
Chronic Kidney Disease	2.77 (1.11, 6.91)	0.029
Cerebrovascular Disease	32.47 (8.99, 117.31)	0.000
Excluding n=19 Cerebrovascular Disease		
Age	1.14 (1.09, 1.20)	0.000*
Chronic Kidney Disease	2.54 (0.99, 6.52)	0.054

*p<.05