Screening, prevalence and ethnic variation of diabetes mellitus in people with acute stroke and transient ischaemic attack: a cross-sectional study in Northland, New Zealand

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ABSTRACT

AIM: To assess our prevalence and screening rate for diabetes and pre-diabetes in people presenting with acute stroke and transient ischaemic attack (TIA) in Northland, New Zealand, as well as identifying discrepancies between Māori and non-Māori, rates of atrial fibrillation (AF) and effect of metformin on stroke.

METHOD: Data was collected retrospectively on people diagnosed with stroke or TIA in Northland, between 1 January 2014 and 31 December 2014.

RESULTS: 345 people presented with acute stroke/TIA. 49.5% had dysglycaemia: 24.3% diabetes, 25.2% pre-diabetes. An HbA1c was performed on 70.4%. Māori had more diabetes (41.6%) than non-Māori (19.4%), with an HbA1c 12 mmol/mol (3.2%) higher, and were 12 years younger on average. There was no difference in AF prevalence between people with and without diabetes, and in the proportion of severe stroke (total anterior circulation infarction) between people with diabetes on metformin and those not.

CONCLUSIONS: The prevalence of dysglycaemia in acute stroke/TIA in Northland is high. The goal of universal HbA1c screening in stroke is not being met. Māori have stroke younger, and a higher prevalence of diabetes may partially explain this. No association between diabetes and AF was found, nor evidence that metformin may be protective against larger strokes.

Diabetes mellitus is a well-known risk factor for stroke, and stroke guidelines recommend that all people suffering TIA or ischaemic stroke should be screened for diabetes. We aimed to assess our prevalence of diabetes and current screening rate for diabetes and diabetic control in those presenting with a new stroke or TIA in our region.

We also wanted to identify any differences between Māori and non-Māori in stroke risk factors, age of occurrence, and outcomes. Northland has a greater proportion of Māori than most other parts of New Zealand (32.4% of the population, mean age 26 years). A recent study from Auckland, New Zealand, identified that stroke rates have been declining since 1991. However, the rate of decline has been slower among Māori, who were also found to have strokes at an earlier age. We wished to assess how differences in diabetes prevalence and glycaemic control between Māori and non-Māori may contribute to inequities in stroke rates.

Diabetes has been shown to be an independent determinant of atrial fibrillation (AF), and AF was identified in 24% of Northland stroke admissions. We therefore sought to explore the association between
ARTICLE

diabetes and AF in our acute stroke/transient ischaemic attack (TIA) population. Finally, there is evidence that metformin use reduces the risk of stroke, so our last objective was to assess whether metformin use is associated with reduced stroke severity as illustrated by stroke subtype.

Methods
This was a retrospective study of all people diagnosed with acute stroke or TIA in Northland between 1 January 2014 and 31 December 2014. All eligible participants were identified by the stroke nurse specialist. Relevant data was collected from electronic records. The data collected included gender, age, smoking status, ethnicity, stroke type, evidence of diabetes or pre-diabetes (based on HbA1c or history) prior to and following hospitalisation, whether HbA1c was checked during hospitalisation, glycaemic control by HbA1c, diabetic treatment and diagnosis of AF. When data were missing or unavailable, the participant was excluded from that outcome of interest. Statistical analysis was performed using Student’s t-test to compare means and a chi-squared test when comparing percentages.

Ethnicity was obtained by self-report. Where multiple self-identified ethnicities were recorded and included Māori, these people were designated as Māori alone. Diabetes and pre-diabetes were defined according to the New Zealand guidelines: HbA1c greater than or equal to 50 mmol/mol (6.7%) for diabetes and HbA1c 41–49 mmol/mol (5.9–6.6%) for pre-diabetes. Screening for diabetes or assessing control was deemed to have occurred if an HbA1c was checked during admission or in the 1 month prior to admission. The stroke nurse specialist determined stroke type according to the Oxford Community Stroke Project classification, based on clinical symptoms and radiological findings, and where there was uncertainty, the clinical data was reviewed by the author and allocated accordingly.

Results
Three hundred and forty-five people were diagnosed with an acute stroke or TIA during the studied timeframe; 193 were men and 152 were women. The mean age was 72.5 years old. Māori comprised 22.3% (77/345), New Zealand Europeans 67.8% (234/345), and all other ethnicities 9.9% (34/345). Of the 304 people where data was available, 16.8% were current smokers, 37.5% were ex-smokers and 45.7% had never smoked.

The overall prevalence of dysglycaemia was 49.5%; 24.3% had diabetes (84/345) and 25.2% had pre-diabetes (87/345). An HbA1c was performed during hospitalisation or in the preceding month on 243 out of 345 people (70.4%). The mean HbA1c overall was 44.3 mmol/mol (6.2%) and 62.1 mmol/mol (7.8%) in the group with diabetes. Only 180 (69%) of the 261 people without a previously known diagnosis of diabetes were screened with an HbA1c, and no new cases of diabetes were detected. Out of 191 people with no prior evidence of diabetes or pre-diabetes, 127 (66.5%) were screened and this yielded 17 new diagnoses of pre-diabetes.

The differences between Māori and non-Māori were outlined in Table 1. Māori

| Table 1: Differences between Māori and non-Māori people with acute stroke or TIA. |
|-----------------------------------|-----------------|-----------------|-----------------|-----------------|
|                                   | Māori           | Non-Māori       | p-value         |
| Mean age (years)                  | 63.4            | 75.2            | <0.05           |
| Diabetes (%)                      | 41.6            | 19.4            | <0.05           |
| Pre-diabetes (%)                  | 20.8            | 26.5            | NS              |
| Mean HbA1c (mmol/mol)             | 69.8            | 57.8            | <0.05           |
| Current smokers (%)               | 32.5            | 9.7             | <0.05           |
| Ex-smokers (%)                    | 29.9            | 34              | NS              |
| Atrial fibrillation (%)           | 42.9            | 26.9            | <0.05           |
| Total anterior circulation infarct (%) | 18.2            | 8.2             | <0.05           |
were significantly younger, twice as likely to have diabetes, have worse glycaemic control, three times more likely to be a current smoker, and a half times more likely to have AF, and more than twice as likely to have a total anterior circulation infarct (TACI).

AF was present in 105 out of the 342 people (30.7%) where data was available. There was no significant difference in AF prevalence between people with diabetes (31% [26/84]) and those without diabetes or pre-diabetes (33.9% [59/174]).

Twenty-three percent (23.2%) of events were TIs, 16.5% lacunar infarcts, 28.7% partial anterior circulation infarcts, 10.4% TACI, 10.7% posterior circulation infarcts, 9% intracerebral haemorrhages, and 1.4% were unable to be classified. No significant difference was found in stroke subtype between people with diabetes and those without diabetes or pre-diabetes. There was also no significant difference in the proportion of TACI between those with diabetes on metformin (5.1%) and those not (15.6%).

**Discussion**

We identified that approximately 50% of Northland people with acute stroke or TIA have dysglycaemia: 24.3% had known diabetes, 20.3% known pre-diabetes, and we diagnosed an additional 4.9% with pre-diabetes through screening with HbA1c alone, although only around 70% of people were screened. This is in comparison to approximately 7% of the general Northland population with known diabetes. Those who were not screened had similar demographics to those who were screened, apart from eight people who were palliated from the time of admission and in whom checking an HbA1c would have been inappropriate. It would still be desirable to improve our screening rate given the high prevalence of dysglycaemia in this population. It has been observed that people with diabetes have one-and-a-half to three times the risk of stroke, and pre-diabetes also carries an increased risk. Screening for dysglycaemia provides an avenue for opportunistic intervention in this high-risk group. The identification of diabetes should alert the clinicians to ensure diabetes knowledge and microvascular screening is up to date. For those people with pre-diabetes, targeted healthy lifestyle information can be provided, and advice given on future HbA1c screening. This is in addition to standard stroke/TIA secondary prevention treatment.

While Māori are not over-represented in terms of stroke/TIA incidence, they present almost 12 years younger than non-Māori, and this could be partially explained by the higher rates of diabetes mellitus, with a 22.6% higher prevalence of diabetes. Glycaemic control was worse in Māori, with the mean HbA1c 12 mmol/mol (3.2%) higher. However, there are clearly other factors as well, including higher rates of smoking and AF amongst Māori.

We were unable to identify a clear association between diabetes and AF. Others have previously found a 1.1% increase in the prevalence of atrial fibrillation among people with diabetes. Forty-six percent of people with diabetes were on metformin, and while those on metformin had a lower proportion of the most severe stroke subtype (TACI) at 5.1%, compared with those not on metformin at 15.6%, this was not statistically significant. We therefore did not show statistically any protective effect from metformin on stroke severity.

There were some limitations in our study. As an observational study, we are unable to prove causality, and there are likely to be confounders. We did not assess pre-stroke/TIA cardiovascular risk status, or the use of aspirin, statins and angiotensin converting enzyme inhibitors prior to admission. The results are predominantly of relevance to our local geographic area, although the data on Māori may be of interest and generalisable to other Māori populations in New Zealand and abroad.

In summary, the prevalence of dysglycaemia in the acute stroke/TIA Northland population is almost 50%. Only around 70% of people presenting with stroke or TIA are having an HbA1c performed. New Zealand Māori with stroke/TIA are more likely to have diabetes and to present at a younger age. HbA1c screening is an important but under-utilised part of acute stroke triage, and improving this could conceivably assist in improving health.
outcomes, particularly in New Zealand Māori, as well as raise awareness of the association between dysglycaemia and stroke. Following the completion of this study, the results were presented to the Whangarei Hospital medical department staff as a reminder to perform an HbA1c on all people presenting to hospital with stroke or TIA. The addition of a ‘vascular event’ panel on the lab request form, containing tests such as HbA1c and lipids, is also under consideration.

Competing interests:
Nil

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