Impact of ethnicity on outcomes after pulmonary embolism: an observational study in South Auckland

Chinthaka B Samaranayake, Elaine Yap

The impact of ethnicity on incidence and outcomes in pulmonary embolism (PE) in the New Zealand population has not been investigated previously. Due to the significant variations in ethnicity make-up of different countries, the currently available international literature is not very applicable to the New Zealand population. Given the significant ethnic disparities among Māori and Pacific Island populations in New Zealand in important cardiovascular conditions, we felt that it was possible that such a variation could also exist in PE. Our objective was to review the incidence and outcomes of patients who were diagnosed with a PE in the ethnically diverse South Auckland population.

Consecutive series of patients confirmed to have had an acute PE on a computed tomography pulmonary artery (CTPA) or a ventilation-perfusion (VQ) scan at our institution over a five-year period from January 2008 to December 2012 were retrospectively identified from electronic records. The demographic and clinical data were collected from electronic patient databases. The rate of all cause 30-day and one-year mortality following PE, bleeding complications, re-admissions and recurrence of venous thromboembolisms (VTE) within 12 months were calculated. The routine anticoagulation protocol for PE used in our institution during the time of the study was low molecular weight heparin (LMWH) at a dose of 1mg/kg twice a day with warfarin initiation. The LMWH heparin was given until the INR is >2.0 on two consecutive days.

Incidence per 100,000 population was calculated using the Counties Manukau Health Board-specific Census 2013 data. Estimated frequencies and proportions for the variables were calculated in descriptive analysis. Multivariate logistic regression analysis was performed to identify predictors of outcomes. The 95% confidence intervals (95% CI) were calculated for rates, and the differences were significant at p value <0.05. Ethical approval for this study was granted by the New Zealand Health and Disability Ethics Committee (13/NTB/199).

A total of 606 patients with a mean age of 61.5 years (SD 16.5) were confirmed to have had a PE on a CTPA or VQ scan. The ethnicity composition of the study population was: 59 (9.2%) Māori, 442 (72.9%) New Zealand European (NZE), 57 (9.5%) Pacific Island, 13 (2.1%) Asian, 14 (2.3%) Indian, 8 (1.3%) other and 16 (2.6%) undisclosed. The incidence of PE per 100,000 population per year for the hospital's catchment were 16.5 for Māori, 41.1 for NZE, 10.9 for Pacific Island and 5.3 for Asian. The relative risk of PE per year for the NZE population compared to Māori, Pacific Island and Asian populations were 2.5 (95% CI 1.3–4.6), 3.8 (95% CI 2.0–7.0) and 7.7 (95% CI 3.2–18.2) respectively. The relative risk of PE in the Māori population compared to Pacific Island population was 1.5 (95% CI 0.7–3.5). The rate of 30-day and one-year mortality following PE was 11.2% (95% CI 9.0–14.0) and 22.9% (95% CI 19.8–26.5) respectively for the total group, with no significant difference observed between the ethnic groups (p=0.12). Ethnicity was not an independent predictor of mortality in regression analysis. A total of 58 (9.6%) patients had bleeding complications secondary to treatment for PE; 26 (4.3%) had major bleeding as per International Society of Thrombosis and Haemostasis criteria. There was no statistically significant difference in the rate of bleeding complications (major or minor) between
the ethnicity groups. Māori patients had a significantly higher length of hospital stay (mean 14.1 days, SD 18.4) following their PE compared to other ethnicity groups (p=0.04). Additionally, Māori and Pacific Island patients had a significantly higher rate of 30-day re-admission rate compared to NZE, Asian and Indian patients (p=0.03). Table 1 summarises the outcome data for different ethnicity groups.

In summary, this is the first study describing both incidence and outcomes after PE in a large ethnically diverse population in New Zealand. New Zealand Europeans had a significantly higher incidence of PE compared to other ethnicities but this did not translate to worse outcomes. One possible explanation of this observed difference is the variation in the incidence of the two most common genetic causes contributing to DVT and PE; mutations in Factor V Leiden and Prothrombin genes.\textsuperscript{5,6} Abnormalities in coagulation, including protein C, protein S and antithrombin deficiency are also at least partially heritable, but their role in differences in thromboembolic rates are less well-defined.\textsuperscript{7} Genetic polymorphisms in endothelial cell nitric oxide synthase gene and the platelet GPIIIa PLA1/A2 glycoprotein genes, which results in pathological alterations in platelet aggregation, has also been described in different ethnicity groups with associated variations in rates of venous thromboemolism.\textsuperscript{8} Our findings are similar to Liao et al who found significantly higher rates of VTE in New Zealand Europeans compared to other ethnicities in North Auckland where the ethnicity make-up is quite different from the South.\textsuperscript{9} In that study, the reported overall rate of VTE was 81.6 per 100,000 population, with a significantly higher relative risk in Europeans compared to Māori, Pacific and Asian patients (1.98 (95% CI 1.63–2.41), 3.22 (95% CI 2.60–3.99) and 4.02 (95% CI 3.34–4.84) respectively).\textsuperscript{9}

Ethnicity was not found to impact on mortality following PE in our study. This is an encouraging finding as Māori and Pacific Island populations are shown to have inferior health outcomes in a number of cardiovascular conditions in New Zealand.\textsuperscript{1,2} Māori patients however did have a higher average length of hospital stay, which we hypothesise to be due to higher rates of comorbidities, as there were no differences in complication rates or PE recurrence in these groups. Similarly, the higher rate

### Table 1: Outcomes following pulmonary embolisms in different ethnicity groups.

<table>
<thead>
<tr>
<th>Outcomes</th>
<th>Ethnicity groups</th>
<th>Total group N=606</th>
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<tbody>
<tr>
<td></td>
<td>Māori n=56 (9.2%)</td>
<td>NZE n=442 (72.9%)</td>
</tr>
<tr>
<td>30-day mortality/n (%)</td>
<td>4 (7.1)</td>
<td>52 (11.8)</td>
</tr>
<tr>
<td>One-year mortality/n (%)</td>
<td>12 (21.4)</td>
<td>99 (22.4)</td>
</tr>
<tr>
<td>Bleeding complications/n (%)</td>
<td>4 (7.1)</td>
<td>43 (9.7)</td>
</tr>
<tr>
<td>Mean length of stay/ days (SD)</td>
<td>14.1 (18.4)*</td>
<td>10.1 (13.9)</td>
</tr>
<tr>
<td>30-day re-admission rate/n (%)</td>
<td>16 (28.6)*</td>
<td>94 (21.3)</td>
</tr>
<tr>
<td>Recurrence within one year/n (%)</td>
<td>2 (3.6)</td>
<td>18 (4.1)</td>
</tr>
</tbody>
</table>

NZE = New Zealand European. Pacific = Pacific Island. * Denotes a statistically significant difference (p<0.05).
of re-admissions to hospital in these two groups were not directly related to the PE or potential complications from the PE.

Our data is limited by the retrospective data collection where it was difficult to ascertain which patients deteriorated after admission to hospital and required escalation of treatment. Despite the large study population, the low numbers in some of the outcome measures meant that there was insufficient power to detect clinically meaningful differences in some of the outcomes. We were only able to calculate the rate of all-cause mortality as it was difficult to accurately determine the causes of death, including mortality related to bleeding complications. Despite these limitations, the described findings are encouraging and provides some relevant information required for better understanding of this important issue in the New Zealand population.

Competing interests:
Nil.

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