Incidence of first heart failure hospitalisation and mortality in Aboriginal and non-Aboriginal patients in Western Australia, 2000–2009 ☆

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ABSTRACT

Objectives: To compare the incidence of first heart failure (HF) hospitalisation, antecedent risk factors and 1-year mortality between Aboriginal and non-Aboriginal populations in Western Australia (2000–2009).

Methods: A population-based cohort aged 20–84 years comprising Aboriginal (n = 1013; mean 54 ± 14 years) and non-Aboriginal patients (n = 16,366; mean 71 ± 11 years) with first HF hospitalisation was evaluated. Age and sex-specific incidence rates and HF antecedents were compared between subpopulations. Regression models were used to examine 30-day and 1-year (in 30-day survivors) mortality.

Results: Aboriginal patients were younger, more likely to reside in rural/remote areas (76% vs 23%) and to be women (50.6% vs 41.7%, all p < 0.001). Aboriginal (versus non-Aboriginal) HF incidence rates were 11-fold higher in men and 23-fold in women aged 20–39 years, declining to about 2-fold in patients aged 70–84 years. Ischaemic and rheumatic heart diseases were more common antecedents of HF in younger (<55 years) Aboriginal versus non-Aboriginal patients (p < 0.001). Hypertension, diabetes, chronic kidney disease, renal failure, chronic obstructive pulmonary disease, and a high Charlson comorbidity index (>= 3) were also more prevalent in younger and older Aboriginal patients (p < 0.001). Although 30-day mortality was similar in both subpopulations, Aboriginal patients aged <55 years had a 1.9 risk-adjusted hazard ratio (HR) for 1-year mortality (p = 0.015).

Conclusions: Aboriginal people had substantially higher age and sex-specific HF incidence rate and prevalence of HF antecedents than their non-Aboriginal counterparts. HR for 1-year mortality was also significantly worse at younger ages, highlighting the urgent need for enhanced primary and secondary prevention of HF in this population.

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1. Introduction

Indigenous populations around the world have poorer health outcomes and reduced life expectancy compared with their non-Indigenous counterparts [1]. Aboriginal and Torres Strait Islander people (herein referred to as Aboriginal) in Australia have the poorest life expectancy compared with Indigenous people living in North America and New Zealand [1]. Life expectancy of Aboriginal Australians is 10–14 years less than that of non-Aboriginal people [2,3], with 70% of the gap in health outcomes due to chronic diseases [4]. Cardiovascular disease (CVD) accounts for the highest contribution (23%) to the differential disease burden in the Aboriginal population, followed by diabetes and chronic respiratory disease [4].

Heart failure (HF) predominantly results from CVD and other antecedent risk factors, including coronary artery disease, hypertension, valvular heart disease, diabetes and chronic kidney disease (CKD) [5]. HF is associated with high morbidity, being ranked as the most frequent cause of hospitalisation and rehospitalisation among patients older than 65 years in the United States [6,7]. HF has a poor prognosis, with five-year mortality of 50–60% and has a population impact likened to cancer [8]. Despite proven secondary prevention treatments for HF, there is still a high recurrence of cardiac events in these patients [6]. Therefore the comparative incidence of HF and related mortality between the Australian Aboriginal and non-Aboriginal populations is likely to be an important indicator of disparities in the health of the Aboriginal population and their medical care.

In Australia, age-adjusted CVD death rates and coronary heart disease rates are about three times higher in Aboriginal compared to non-Aboriginal population [9,10]. Aboriginal Australians are reported to be nearly four times more likely to have diabetes, have high excess of alcohol consumption (in Aboriginal people who do drink), hypertension, obesity, long-term kidney disease, and a greater comorbidity burden compared with non-Aboriginal Australians [9]. Additionally, Aboriginal Australians have one of the highest rates of acute rheumatic fever and rheumatic heart disease in the world [11]. These same conditions and risk factors are also key antecedents leading to HF.

Despite this, the existing HF literature has been focused on the mainstream populations while the epidemiology of HF in the Aboriginal and other Indigenous populations are poorly delineated. In a systematic review undertaken by Woods et al. [12], no peer-reviewed population-based studies on the incidence of HF in Aboriginal Australians was found, although one cross-sectional study in six Aboriginal communities (n = 436) in central Australia [13] reported a 5.3% prevalence of HF in that sample, of whom only 35% had previously been diagnosed [13]. No population-based data on HF mortality had been reported among Aboriginal Australians [12].

Given the current knowledge gap in the epidemiology of HF in the Australian Aboriginal population, this study aims to compare the Aboriginal and non-Aboriginal populations of Western Australia (WA) with respect to: 1) the incidence of first-ever HF hospitalisation; 2) prevalence of antecedent HF risk factors; and 3) risk-adjusted 30-day and 1-year all-cause mortality (in 30-day survivors) after first HF hospitalisation.

2. Methodology

2.1. Setting

WA is the largest state of the six states in Australia with land spanning 2.53 million km^2 (976,790 miles^2) and is home to the third highest number of Aboriginal Australians (13.2%). Of the 2.5 million inhabitants in WA, 3.8% are Aboriginal. Based on the 2006 census, an estimate of 73% of the WA population lived in the capital city, while 41% of Aboriginal people lived in remote or very remote areas. Australia has a universal health care system with free public acute hospital services, while allowing choice through a mix of public and private health care service providers. The universal health insurance scheme (Medicare) funds free universal access to public hospital treatment and subsidizes out-of-hospital medical consultations and pharmaceuticals. However, despite these subsidies, barriers to specialist consultations remain for socially disadvantaged groups, particularly where upfront cash payments are needed. Approximately 70% of hospital beds in WA are publicly funded.

2.2. Study design and data sources

Since the 1970s administrative data for all hospitalisations in WA including principal and secondary discharge diagnoses have been recorded in the Hospital Morbidity Data Collection (HMDC), which is regularly audited for quality and accuracy [14]. The HMDC is routinely linked to other core datasets (including the Mortality register) as part of the WA Data Linkage System which uses probabilistic matching and has greater than 99% accuracy [14].

This population-based cohort study used linked health data for all WA residents aged 20–84 years who were admitted to hospital with a first-ever HF diagnosis between 2000 and 2009. A fixed clearance period of 10 years was used to exclude any prevalent cases admitted for HF in the previous 10 years, thus identifying first-ever cases. Using the same methods as described previously [15], HF was identified as a principal discharge diagnosis or as a secondary diagnosis with a principal diagnosis of a cardiovascular condition, excluding acute myocardial infarction (AMI). The coding for HF as a principal discharge diagnosis in the WA HMDC has been previously validated against the Boston diagnostic

criteria with a positive predictive value of 92.4% for 'definite' HF and 98.8% for a combined 'possible' and 'definite' HF [16].

2.3. Aboriginality

The accuracy of the recording of Aboriginality in the HMDC has been examined against an urban-dwelling population of 993 adult Aboriginal participants, with sensitivity exceeding 90% since 2002 [17], although specificity was not evaluated [17]. Due to the well-documented under-recording of Aboriginal status in administrative health records in Australia [18], a patient was defined as being Aboriginal if at least 25% of hospital admissions for that person over the period 1980 to 2009 had been coded as Aboriginal. This definition identified a total of 1013 Aboriginal index HF patients, who were selected as the cohort for comparison.

A sensitivity analysis was undertaken using a more inclusive definition, namely 'Aboriginal–ever', where Aboriginal status was recorded in any of the hospital admissions since 1980, which identified 1231 Aboriginal index HF patients. In addition, a more restricted definition of 'Aboriginal on index admission' was compared, where Aboriginal status was recorded only in the index HF admission, which identified 981 Aboriginal index HF patients.

2.4. Comorbidity

A weighted Charlson comorbidity Index (CCI) was calculated for each patient based on the ICD diagnostic codes recorded in the HMDC records within 5 years prior to index hospitalisation. A prior or coexisting history of the following conditions were similarly identified: hypertension, atrial fibrillation (AF), rheumatic fever & rheumatic heart disease, diabetes, valvular heart disease, chronic kidney disease (CKD), renal failure, chronic obstructive pulmonary disease (COPD), unstable angina, acute myocardial infarction (AMI), other ischaemic heart disease (IHD), and cerebrovascular disease (CeVD).

2.5. Interventions

Coronary artery revascularisation procedures, with either percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG) within five years prior or undertaken during the index HF admission, were identified from the linked HMD. Other procedures of interest, specifically coronary angiography and dialysis, were similarly identified.

2.6. Socio-economic status and rural residence

Socio-Economic Indices for Areas (SEIFA) [19], were assigned to each patient based on residential postcodes and divided into quintiles, based on pre-defined cut-points. The first quintile (Q1) represents the most disadvantaged group and fifth quintile (Q5) the least. The Accessibility/Remoteness Index of Australia (ARIA) classification was used to define the five categories of remoteness based on road distance to service centres: Highly accessible; Accessible; Moderately accessible; Remote and Very remote [20]. For the regression analysis, place of residence was dichotomised into metropolitan residence (based on the Perth Capital City definition) and rural residence. Public hospitals were categorised as metropolitan teaching, metropolitan non-teaching, rural regional (larger) and rural district (smaller) hospitals. Private hospital included rural and metropolitan hospitals.

2.7. Data analysis

Index hospitalisations for HF were divided into three calendar periods: 2000–2002, 2003–2005, 2006–2009, for comparison purposes. Age-specific incidence rates and incidence rate ratios of HF were calculated for each age group (20–39 years, 40–54 years, 55–69 years and