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The epidemiology of hip fractures across western Victoria, Australia

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ABSTRACT

Background: Hip fractures are associated with considerable morbidity and mortality. Hip fracture incidence varies across different levels of accessibility/remoteness and socioeconomic status (SES). As part of the Ageing, Chronic Disease and Injury Study, we aimed to map the pattern of hip fractures across the western region of the Australian state of Victoria, which contains a range of remoteness levels and SES.

Methods: Data on hip fractures resulting in hospital admission were extracted from the Victorian Admitted Episodes Dataset (VAED) for men and women aged 40+ years during 2010–2013 inclusive. An age-adjusted incidence rate (per 10,000 population/year) was calculated for the entire region. Crude incidence rates and length of acute care hospital stay (excluding rehabilitation) were calculated for each Local Government Area (LGA). The impact of aggregated age, accessibility/remoteness index of Australia (ARIA) and SES on hip fracture rates aggregated across LGAs was determined using Poisson regression.

Results: For men, the age-standardised rate of hospitalisations for hip fracture across the whole region was 19.2 per 10,000 population/year (95%CI 18.0–20.4) and for women, 40.0 (95%CI 38.3–41.7). The highest incidence rates for both sexes occurred in the less accessible LGAs of Yarriambiack and Hindmarsh, as well as the LGA with the lowest SES, Central Goldfields. In both sexes, approximately two thirds of individuals were discharged from acute hospital care within 14 days. Increasing age, higher remoteness and lower SES were all associated with higher hip fracture rates.

Conclusion: Crude incidence rates varied by location. Given that a high proportion of patients had acute hospital care of ≤14 days, and accessibility and SES were associated with hip fracture rates, these results can inform policy and provide a model for other groups to conduct similar research in their local environment.

1. Introduction

Hip fractures are associated with considerable morbidity and can lead to decreased quality of life, chronic pain, disability, increased demand on health infrastructure and institutionalisation, as well as an increase in mortality [1–4]. Hip fractures are a significant public health issue for both sexes; one in three hip fractures occur in men and mortality is 2–3 times higher than in women [5]. Hip fractures are also associated with extended hospital stays and significant hospitalisation costs. In Australia, between 2008 and 2009, older men and women who sustained hip fractures had a mean length of stay (including readmissions) of 30.8 days, and mean hospitalisation cost between AUD$23,243 and AUD$33,576 per admission [6,7]. The incidence of hip fractures seems to have stabilised or even declined in developed countries [3,5,8,9], however, the absolute numbers of hip fractures

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and additional comorbidities are increasing due to an ageing population [3,10].

Risk factors for hip fractures include advanced age, female sex, greater height, low bone mineral density (BMD), low body mass index (BMI), comorbidities, smoking, drinking (alcohol), reduced cognitive function, impaired vision, medication use, impaired balance, physical inactivity and falls [10–12]. Place of residence is also an important risk factor for hip fractures and length of stay post-fracture [13]. Geographical variations in hip fracture rates between countries, and in different regions in the same country, have been reported [2,14]. For example, hip fracture rates are nearly seven times higher in northern, compared to southern, European countries [2,14]. A similar pattern exists across North America, where the more northern states of America have a higher hip fracture rate than southern states [2].

Residents of urban areas have been reported to have a ~30% higher risk of hip fracture than residents of rural areas and data suggest that this is not entirely due to the preferential placement of aged-care institutions in urban areas [15,16]. Previous studies have also reported that individuals living in urban areas have lower BMD, which may contribute to higher hip fracture rates [1,12,17,18]. A higher incidence of fractures at all skeletal sites in urban areas has also been reported in the USA [19] and in Australia [16]. However, this pattern is not supported in all studies. In Australia, health is generally poorer in rural residents due to lesser accessibility to health services and migration of older individuals away from urban areas following retirement [20]. Individuals living in rural areas are three times less likely to undergo BMD testing, are less likely to use vitamin D supplements, calcium supplements or bisphosphonates and thus are less likely to be aware that they have osteoporosis, or receive treatment to manage osteoporosis, than individuals who live in an urban area [20]. Socioeconomic status (SES), measured at the area-level (rather than an individual level), is another factor that affects hip fracture incidence. A higher incidence of hip fractures has been reported in areas with lower SES, which may be mediated by a lower BMD in lower SES areas [12,18,21]. Our data on the impact of SES on major osteoporotic fractures (including hip fracture) also indicated that individuals with lower SES had higher rates of these type of fractures [22]. However, a few studies have reported a lower hip fracture incidence in lower SES areas [3,23] and one reports no association between SES and hip fracture rates [24].

This study forms part of the larger Ageing, Chronic Disease and Injury (ACDI) study [25], which aims to map the pattern of chronic diseases and injury across the western region of the Australian state of Victoria. The ACDI study region includes urban, rural and agricultural areas, with a range of SES. The ability to identify gaps in healthcare service delivery, as well as implement intervention and prevention strategies is dependent upon obtaining contemporary data. The ACDI study will provide this type of data, allowing targeted resource allocation to effectively manage the burden of chronic disease and injury, as well as demonstrating a profiling model which can be used in other geographical regions, particularly in non-metropolitan settings. Studies from this region will also allow assessments of internal (in region) changes in health practices and how these impact healthcare, as well as comparison to other regions. This may allow broader validation of not only hip fractures, but also a range of other drivers of fractures and healthcare outcomes. This study aimed to investigate the incidence of hip fractures in men and women aged 40+ years as part of the larger ACDI study.

2. Methods

2.1. Study region

Australia comprises eight states and territories; the state of Victoria is the second most populous (Fig. 1). In Victoria, there are 79 clearly-defined geographical regions known as Local Government Areas (LGAs). The study region includes 21 of these 79 LGAs, making up nearly one-third of the state by area. In 2011, the estimated residential population for the study region was 617,794, representing ~11% of the population in Victoria. The study region encompasses a large number of individuals aged 40 years or older; they constitute ~51% (~316,000) of the total population [26]. The study region covers large agricultural areas that generate 60% of the state's total dairy production and major cropping areas in its north-west sector. Overall, there is a trend for an increasing proportion of the population to be aged 40+ years in the more western (rural) areas of the study region (Fig. 1). This is a sentinel area from which the evidence may inform other regions and locations.

The study region contains LGAs with different levels of accessibility and remoteness. We used the Australian Bureau of Statistic's (ABS) Accessibility/Remoteness Index of Australia (ARIA) classification score to estimate urban or rural status. ARIA takes into account distance from localities, access to goods and services and opportunities for social interaction [27]. These scores are divided into five categories ranging from highly accessible (≤1.84), accessible (1.84–3.51), moderately accessible (3.51–5.80), remote (5.80–9.08) and very remote (≥9.08). In this study region, the LGAs of Hindmarsh, West Wimmera and Yarriambiack have the highest ARIA scores (4.4, 4.1 and 3.9 respectively), which are in the 'moderately accessible' category. These areas are mostly agricultural based LGAs producing grain and sheep [28]. The other LGAs in the study region are in the 'highly accessible' or 'accessible' categories, with no LGAs in the 'remote' or 'very remote' categories. It is also important to note that within Victoria the highest possible ARIA is 4.4, that belongs to the LGA of Hindmarsh in the study region. Three of the LGAs in the region (Hindmarsh, West Wimmera and Yarriambiack) rank within the top five LGAs with the highest ARIA scores in Victoria; Hindmarsh ranks as first (4.4), West Wimmera second (4.1), East Gippsland third (3.9), Yarriambiack fourth (3.9) and Mildura, fifth (3.8).

The study region also has a wide range of SES, as measured by the Index for Relative Socioeconomic Advantage and Disadvantage (IRSAD) scores (2011 Census data). IRSAD scores are divided into deciles using cut-points for the state of Victoria, with decile 1 being the most disadvantaged (IRSAD < 931) and decile 10 being the most advantaged (IRSAD > 1059) [29]. The study region contains LGAs across all deciles of IRSAD scores, except for the sixth decile.

2.2. Data source

The data source for this study was the Victorian Admitted Episodes Dataset (VAED), which provides a complete dataset of all public and private hospital admissions in the state of Victoria, Australia. In Victoria, all residents have access to hospital-based health care (either publicly or privately funded, depending on health insurance status). The VAED currently uses the International Classification of Diseases and Related Health Problems, Tenth Revision, Australian Modifications (ICD-10-AM) [30], which has eight codes for "fracture of femur", however only three of them are related to hip fractures (S57.0, S57.1 and S57.2). We obtained aggregate data from the VAED for all hospital admissions occurring in the region during the years 2010 to 2013 inclusive, with a diagnosis of hip fracture. This study, is part of the larger ACDI study [25] which aims to determine the burden of chronic conditions across the region of western Victoria, among individuals aged 40 years and over. Therefore, for this analysis, we excluded data for individuals aged <40 years as hip fracture rates are low in younger ages and are more likely to be due to higher energy trauma. We also obtained data from the VAED regarding the length of acute care stay in hospital (excluding rehabilitation), stratified by weeks. The Barwon Health Human Research Ethics Committee approved this study (HREC 15/11).

2.3. Statistical analyses

Analyses were performed using aggregated data from 2010 to 2013 (inclusive). This is unlikely to have caused problems with the statistical analysis because hip fracture incidence did not change significantly over this time period. For the four years investigated, 2010, 2011, 2012 and