Heart, Lung and Circulation (2015) **24,** 442–449
1443-9506/04/$36.00
http://dx.doi.org/10.1016/j.hlc.2014.11.022

ORIGINAL ARTICLE

Age-specific Gender Differences in Long-term Recurrence and Mortality following Incident Myocardial Infarction: A Population-based Study

Lee Nedkoff, MPH [a*], Emily Atkins, BHlthSc [a], Matthew Knuiman, PhD [a], Frank M. Sanfilippo, PhD [a], Jamie Rankin, MBBS, FRACP [c], Joseph Hung, MBBS, FRACP, FACC [a,b]

[a]School of Population Health, The University of Western Australia, Crawley, Western Australia 6009
[b]School of Medicine and Pharmacology, Sir Charles Gairdner Hospital Unit, The University of Western Australia, Crawley, Western Australia, 6009
[c]Cardiology Department, Royal Perth Hospital, Perth, Western Australia, 6000

Online published-ahead-of-print 19 December 2014

Background Higher mortality following myocardial infarction (MI) is reported in women compared with men with short-term follow-up. Our study aim was to compare long-term gender- and age-specific outcomes following incident MI.

Methods 30-day survivors of incident MI from 2003-2009 were identified from linked administrative data in Western Australia. Outcomes identified were recurrent MI, and cardiovascular and all-cause mortality. Follow-up data was available until 30th June 2011. Unadjusted risk out to eight-years was estimated from Kaplan-Meier survival curves, and multivariate Cox regression models were used to estimate relative risk in women compared with men by age group.

Results There were 12,420 30-day survivors of incident MI from 2003-2009 (males 71.2%). Women had higher levels of comorbidities across all age groups compared with men. Unadjusted event risks were higher in women than men overall, underpinned by higher risk of recurrent MI in 55-69 year-old women and of cardiovascular mortality across all age groups in women. Gender differences were generally attenuated after adjustment for demographic factors and comorbidities.

Conclusions This study highlights the elevated risk of cardiovascular events in women compared with men with long-term follow-up, and demonstrates the need for improved long-term secondary prevention in this patient group.

Keywords Myocardial infarction • Gender • Age-specific • Recurrence • Mortality

Introduction

Coronary heart disease (CHD) contributes significantly to the burden of morbidity and mortality in the general population [1]. Despite improvements in short and long-term survival following a myocardial infarction (MI) over recent decades [2,3], the risk of a subsequent MI or death remains elevated [4]. There is evidence of gender differences in survival, with

*Corresponding author at: School of Population Health, M431, The University of Western Australia, 35 Stirling Highway, Crawley Western Australia 6009. Tel.: +61 8 6488 1261, Email: lee.nedkoff@uwa.edu.au

women reported to have higher short-term mortality rates [5], however there are less data available on gender differences in long-term outcomes. It has been suggested that age and a greater prevalence of comorbidities may be associated with this apparent difference [5,6]. More recent reports suggest that the burden of adverse outcomes is also evident in younger women who experience an MI [6,7]. Given reports of an increase in the incidence of MI in younger people [8], and specifically in younger women in WA [9], this question warrants investigation in an Australian context to determine whether age-specific gender disparities exist.

Significant gaps still remain in the delivery of guideline-recommended levels of secondary prevention measures post-MI [10], and age and gender are important variables in determining the risk of future cardiovascular events in CHD patients. It is therefore imperative that age-specific gender outcomes are described to ascertain particularly high-risk target groups for enhanced secondary prevention measures. Thus the study aim was to determine the age-specific impact of gender on long-term MI recurrence and mortality in 30-day survivors of incident MI in a population-based setting.

Methods

Data Source

Data for this study were obtained from two of the core datasets of the WA Data Linkage System (WADLS) - the Hospital Morbidity Data Collection (HMDC) and Death Register. These data are linked centrally by the WADLS using probabilistic matching, with >99% accuracy for this process [11]. The majority of acute coronary care and all invasive revascularisation procedures are undertaken in the tertiary hospitals (public and private) situated in the capital city, Perth. The person-based linked dataset available for this study contained all records for any patient hospitalised with or dying from cardiovascular disease (CVD) in WA from 1985-2010. Variables available included demographic information, principal discharge diagnosis, 20 secondary discharge diagnosis fields, and inpatient procedures. Discharge pharmacy data was available for incident MI cases admitted to the three adult tertiary hospitals, and linked to the matching hospital admission by a unique admission identifier. The data used in this study are de-identified, and the study was granted a waiver of informed consent from each ethics committee. Approval for this study was obtained from the ethics committees of The University of Western Australia and the WA Department of Health.

Incident MI Cohort

All MI cases hospitalised in WA from 2003 to 2009 were identified using the principal discharge diagnosis field (ICD-10-AM I21,I22). Cases were classified as an incident if there were no hospitalisations for acute coronary syndromes in the 16 years prior to the MI admission [12]. Patients aged 35 to 84 years of age who survived greater than 30 days following the incident MI, were included in the cohort.

Patient Characteristics

Comorbidities were identified from the linked dataset if recorded in the 16 years prior to or on the incident admission. These included: hypertension (ICD-10-AM I10-I15 and ICD-9-CM equivalent), diabetes (E10-E14), heart failure (I50), atrial fibrillation (I48), stroke (I60-I64), peripheral arterial disease (I70-I79), and chronic kidney disease (CKD)[13]. History of coronary heart disease (CHD) was identified where there was prior hospitalisation for stable angina or other CHD (I20.1-I20.9, I24-I25). Revascularisation procedures (percutaneous coronary intervention (PCI) or coronary artery bypass grafting (CABG)) occurring during the incident episode (including following transfer to a metropolitan hospital) were identified from any of the 11 procedure fields. Utilisation of evidence-based medications following MI was determined by identifying drugs dispensed at discharge for tertiary hospital patients with a length of stay greater than one day and at least one pharmacy record in the dataset. The analysis was restricted to this sample of patients because discharge pharmacotherapy data are only available for linkage for tertiary hospital patients. The drug groups analysed were antiplatelet therapy (eg, aspirin), angiotensin-converting enzyme inhibitors (ACEIs) and angiotensin II receptor blockers (ARBs), lipid-lowering drugs, beta blockers, and calcium channel blockers. Aspirin use in pain management was excluded by checking the directions on prescriptions for aspirin 300 mg. Drugs dispensed as part of a clinical trial were excluded.

Outcomes

The endpoints of recurrent MI, CVD mortality and all-cause mortality were identified. Recurrent MI was identified where recorded in the principal discharge diagnosis field >30 days following the incident hospitalisation. CVD deaths were identified where the underlying cause of death was coded as any cardiovascular-related cause (ICD-10-AM I00-I99). Follow-up data were available to 30th June 2011 for all patients, providing minimum and maximum follow-up periods of 18 months and 8.5 years respectively.

Statistical Analyses

Patient characteristics and discharge pharmacotherapy are presented separately for men and women. Differences in the proportion of men and women dispensed drugs from each category were compared by chi-squared tests. Unadjusted risks were derived from Kaplan Meier survival curves. Time to event was calculated from the date of the incident MI hospitalisation to the date of the event (MI, CVD death and all-cause death), or censored at the end of followup or at an intervening event (death for recurrent MI endpoint or non-CVD death for the CVD death endpoint), whichever came first. The log-rank p-value test was used to compare men and women within each age group.