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Impact of asthma on mortality in older women: An Australian cohort study of 10,413 women

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ABSTRACT

Background: Comorbid conditions frequently coexist with asthma in older adults and can alter the natural history of asthma, complicating management and affecting overall prognosis and survival.
Objectives: This study investigates the impact of asthma on mortality among older women, with a specific interest in influence of comorbidities and social factors on survival of older women with asthma.
Design: Participants were from the Australian Longitudinal Study on Women's Health and were born between 1921 and 1926. Cox proportional hazards were used to evaluate mortality rates for women with and without asthma, after adjustment for comorbidities and other factors.
Results: Of 10,413 women aged 73–78, 829 (8%) reported having been diagnosed by a doctor for asthma. Women with asthma had a higher likelihood of heart disease, hypertension, thrombosis, bronchitis/emphysema, osteoporosis and major illnesses ($p < 0.0001$). Asthma was associated with increased risk of death (HR = 1.31, 95%CI 1.18–1.45, $p < 0.0001$). After adjusting for age, demographic factors, comorbidities, risk factors, residential area and social support, women with asthma retained a 17% increased risk of death compared to women without asthma (HR = 1.17, 95%CI 1.03–1.32, $p = 0.016$).
Conclusion: Older women with asthma have a higher rate of mortality compared with other women of the same age. This increased risk of death remains after age, demographic factors, comorbidities, risk factors, residential area and social support have been taken into account.

1. Introduction

Asthma is a significant global health issue affecting about 235–300 million people worldwide of all ages and ethnicities [1]. According to an international health survey across 70 countries, the global prevalence of diagnosed asthma in adults is between 4.3%–4.5%, with highest prevalence rates in those aged 75 years and over (7% in 2001, 8% in 2004–05 and 10% in 2007) [2,3]. The true prevalence rates in older adults may be higher than previously thought, as asthma is difficult to diagnose in this age group. These difficulties include problems performing respiratory tests due to frailty, other diseases having similar symptoms to asthma which can mask the diagnosis [2,4–6], and misdiagnosis as COPD [7].

In Australia, the prevalence of asthma in women is 10.9% compared with 8.9% in men and is highest amongst women aged 75 years and over (13.4%) [2]. Older women also have higher death rates from asthma compared with men (10/100 000 vs. 7/100 000) [8]. It is of concern that while mortality rates associated with asthma have declined globally, they have increased in the elderly. Deaths attributed to asthma are estimated as 6 deaths per 100,000 in those aged over 65 years old [8–11]. In 2003, over two-thirds (69%) of asthma-related deaths in Australia were among older people (65 + years old) [3,8]. As the population ages, asthma death rates are expected to increase and by 2050, it is estimated that 80% of all asthma deaths will occur in people over 60 years of age [12].

Death among people with asthma is thought to be influenced by co-morbidities such as diabetes, heart disease, stroke and cancer [13]. Comorbid conditions frequently coexist with asthma and can alter the natural history of the disease, complicating management and affecting the overall prognosis and survival [14–16]. According to the Australian Institute of Health and Welfare (AIHW) asthma series, people aged 65 years and over who died from asthma often had complications of acute respiratory tract infections (36%) and cardiovascular conditions (39%) [17]. Research has also

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demonstrated that asthma mortality is affected by age, weight, physical performance and cognitive factors [18]. These factors may also impact asthma management by increasing the risk of drug interactions or decreasing medication adherence [15].

Demographic and social factors can also affect asthma mortality. Older people living alone are more likely to have difficulties in adhering to medications due to forgetfulness or financial problems [15]. Women who care for their spouses are more likely to suffer from bad health and are more susceptible to social isolation. These circumstances may affect asthma outcomes [14].

While some studies have investigated the factors what influence asthma in children and early adulthood [19,20], few studies have examined the natural history and outcomes of asthma in the elderly [21,22]. The aims of this study were two-fold: (1) to determine if asthma is a predictor of mortality in older women, taking into account possible misclassification of the disease; and (2) to evaluate whether asthma is an independent predictor of mortality rates in older women, after controlling for known predictors of survival including comorbidities and social factors.

2. Methods

2.1. Study population and data source

Participants were recruited from the Australian Longitudinal Study on Women's Health (ALSWH, www.alswh.org.au), a prospective cohort study that commenced in 1996. This study examines the health and wellbeing of over 40,000 Australian women through surveying three birth cohorts born 1921–1926, 1946–1951 and 1973–1978. Recruitment procedures and participant characteristics for the original ALSWH sample have been described elsewhere [23]. This paper examines data from the 1921–1926 cohort. In 1996, 12,432 women completed the first survey (aged 70–75). The cohort has been surveyed a further five times at regular three-year intervals until 2011.

Eligibility for this study was defined as participants who responded to the questions about recently diagnosed asthma, bronchitis/emphysema and breathing difficulties in Survey 2 completed in 1999 and for whom follow-up time could be determined by March 2012 (end of Survey 6 follow-up). Human Research Ethics Committees at the Universities of Newcastle and Queensland approved this research.

2.2. Variables

2.2.1. Mortality

Deaths were confirmed from the National Death Index (NDI) [24]. Participants who had not died were censored at the return date of their sixth survey or 15th March 2012, whichever occurred first. Given the delay in notification from the NDI, this cut-off time was appropriate to allow complete information on deaths within the cohort. A binary variable was assigned for each participant to indicate death or censoring.

2.2.2. Asthma case definitions

At survey 2, women were asked “In the last 3 years have you been told by a doctor that you have: Asthma” (Yes/No), as well as “In the last 3 years have you been told by a doctor that you have: Bronchitis/Emphysema” (Yes/No). Additionally, women also responded to a question about whether they had experienced any breathing difficulties in the past 12 months, with response options of “Never” and “Rarely” being classified as ‘No’ while “Sometimes” and “Often” responses were classified as ‘Yes’.

As there may be misclassification in the diagnosis of asthma for older women [14,18,25], we evaluated four different definitions using self-reported asthma with and without the inclusion of other respiratory conditions or symptoms, namely: (i) asthma; (ii) asthma or bronchitis/emphysema; (iii) asthma or breathing difficulties; and (iv) asthma or bronchitis/emphysema or breathing difficulties.

2.2.3. Other variables of interest

Participant's area of residence was classified as either major city, regional area or remote area, according to the ARIA + geographical classification criteria [26]. Participants were asked about their current marital status with response options of: married; de facto relationship; separated; divorced; widowed; or never married. Women who had responded as either married or in a de facto relationship were classified as having a current partner, while all other responses were classified as not having a current partner. Alcohol consumption was measured in terms of frequency and quantity over a typical week and then categorised as per the NHMRC guidelines [27]. Risky drinking was defined as drinking more than four drinks on any one occasion or drinking more than two drinks per day in a typical week. Low risk drinking was defined as drinking less than 4 drinks on any one occasion, 1 or 2 drinks per day in a typical day or 3 or 4 drinks no more than 4 days a week [27]. According to their smoking responses, women were categorised as either non-smoker, ex-smoker or current smoker. Body Mass Index (BMI) was calculated and categorised according to WHO guidelines [28]. Social support was measured using modified version of Duke's Social Support Index (DSSI) [29]. Data on other comorbidities was collected at Survey 2. These included heart disease, thrombosis, osteoporosis, low iron level, hypertension, diabetes, stroke and cancer (excluding skin cancers).

2.2.4. Analysis

The prevalence for each of the case definitions was calculated and reported. Descriptive characteristics between women with asthma (case definition (i)) and its respective control group were compared. Kaplan-Meier methods were used to estimate survival probabilities over time for women with and without asthma with survival defined as the time between the date of completing Survey 2 and death/censor. The cumulative mortality according to asthma status was graphed, truncated at 12 years of follow-up. Cox proportional hazard models were used to estimate the effect of asthma on risk of death. Nested multivariate proportional hazard models demonstrated the sequential impact of age, demographic data, risk factors, social support and comorbidities on the association between the asthma case definition and mortality risk and were defined as:

(i) Asthma;
(ii) Asthma + age
(iii) Asthma + age + demographics;
(iv) Asthma + age + demographics + health behaviours;
(v) Asthma + age + demographics + health behaviours + Duke's Support Scale Index (DSSI);
(vi) Asthma + age + demographics + health behaviours + Duke's Support Scale Index (DSSI) + comorbidities.

All four asthma case definitions were evaluated within these six models.

As there may be misclassification between asthma and COPD, a sensitivity analysis was performed with mutually exclusive restrictions for asthma and COPD (ie. bronchitis/emphysema). Against women with no reported respiratory conditions (ie. no asthma and no bronchitis/emphysema), we also examined mortality for (a) women with asthma with no bronchitis/emphysema (“asthma only”), (b) women with bronchitis/emphysema with no