Predictors and persistence of foot problems in women aged 70 years and over: A prospective study

Hylton B. Menz [a,*], Elizabeth L.M. Barr [b], Wendy J. Brown [c]

[a] Musculoskeletal Research Centre, Faculty of Health Sciences, La Trobe University, Bundoora, Victoria 3086, Australia
[b] Baker IDI Heart and Diabetes Institute, Melbourne, Victoria 3004, Australia
[c] School of Human Movement Studies, Faculty of Health Sciences, University of Queensland, St Lucia, Queensland 4067, Australia

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ABSTRACT

Objective: To examine the prevalence and correlates of foot problems in older women over a 6-year period.
Study design: Women aged 70–75 years who participated in the Australian Longitudinal Study on Women's Health completed a postal questionnaire incorporating questions relating to demographics, major medical conditions and health status in 1999 ($n = 8059$) and 2005 ($n = 4745$).
Main outcome measures: Self-reported foot problems at baseline and at 6 years follow-up, major medical conditions, body mass index (BMI).
Results: At baseline, 26% of the sample reported foot problems. At follow-up, 37% remained free of foot problems, 36% had developed a new foot problem, 13% experienced resolution of their foot problems and 14% experienced persistent foot problems. Increase in BMI was significantly associated with the development of new foot problems and the persistence of existing foot problems.
Conclusions: Foot problems are common in older women and are associated with increased BMI. Maintaining a healthy bodyweight may therefore play a role in the prevention of foot disorders in older women.

1. Introduction

Foot problems are a common cause of pain and discomfort in the older population, affecting approximately one in three people aged over 65 years [1–3]. In older people, foot pain is associated with decreased ability to undertake activities of daily living, problems with balance and gait, and an increased risk of falls [4–6]. Several studies have indicated that women have a much higher prevalence of foot conditions than men, particularly hallux valgus ('bunions'), corns and calluses [7–9], and are more likely to report foot pain [7,10–12]. The wearing of shoes with an elevated heel and narrow toe box may be partly responsible for the higher rate of foot pain in women, as this type of footwear is strongly associated with hallux valgus and deformity of the lesser toes [13]. However, women are also more likely to report musculoskeletal pain and pain interference in general [14].

In addition to increased age and female sex, several potential risk factors for foot problems have been identified, including obesity [6,10,11,15], and multiple chronic conditions such as osteoarthritis and diabetes [6,11,15]. However, these studies have all been cross-sectional, so the temporal relationships between these factors are uncertain. Furthermore, no longitudinal studies have been conducted to determine whether foot problems in older women resolve or persist over time. To the authors' knowledge, only two prospective studies incorporating information about foot problems have been conducted in older people, both of which reported that foot problems were associated with a decline in physical functioning [4,16]. However, no analyses were undertaken to determine which factors predicted onset of foot problems, or whether foot problems persisted or resolved over the follow-up period.

Determining the natural history of foot problems and the factors associated with both prevalent and incident foot problems would improve our understanding of this common problem and assist in the development of effective interventions. Therefore, the objectives of this study were to examine the prevalence and correlates of foot problems at baseline, and factors associated with new, resolved and persistent foot problems over a 6-year prospective follow-up period in a large sample of older women.

2. Methods

2.1. Participants

This research was conducted as part of the Australian Longitudinal Study on Women's Health (ALSWH), which is a prospective

* Corresponding author. Tel.: +61 3 9479 5801; fax: +61 3 9479 5415.
E-mail addresses: h.menz@latrobe.edu.au (H.B. Menz),
elizabeth.barr@bakeridi.org.au (E.L.M. Barr), wbrown@hms.uq.edu.au (W.J. Brown).

study of factors affecting the health and wellbeing of three birth cohorts of Australian women (born in 1973–1978, 1946–1951 and 1921–1926) [17]. The samples were randomly selected from the national Medicare database, with intentional over-representation of women living in rural and remote areas [17,18]. More details about the study can be found at: http://www.alswh.org.au. The focus of the current study is on women from the older cohort who have been surveyed four times over a 9-year period, from 1996 to 2005. At survey 1, respondents ($n = 12,432$; age 70–75 years) were broadly representative of the national population of women in this age-group [19]. Survey 2 ($n = 10,434$) was conducted in 1999, survey 3 ($n = 8646$) was conducted in 2002 and survey 4 ($n = 7153$) was conducted in 2005. The response rates from baseline for each of the follow-up surveys were as follows: survey 2 – 84%, survey 3 – 78%, and survey 4 – 68%. A previous analysis of attrition between surveys indicated that non-responders were more likely to have less education, be born in a non-English speaking country, be a current smoker and have poorer health than responders [20]. The analyses presented in this paper are based on data obtained during survey 2 and survey 4 (hereafter referred to as "baseline" and "follow-up", respectively), as survey 1 did not incorporate any questions pertaining to foot problems. The study was approved by the University of Newcastle Ethics Committee, and written informed consent was obtained from all participants.

2.2. Postal questionnaire

The postal questionnaire incorporated more than 300 questions about demographics, major medical conditions, health status and health service utilization [18,19]. Complete details of each survey are available on the study website (http://www.alswh.org.au).

2.3. Height, weight and body mass index

Height and weight were assessed at each survey by asking "What is your current weight/height (without shoes)?" Body mass index (BMI) was calculated as weight (kg)/height (m)^2, and obesity was classified as BMI ≥ 30 kg/m^2, according to the World Health Organization criteria [21].

2.4. Major medical conditions

Information on major medical conditions was obtained by asking "In the last 3 years, have you been told by a doctor that you have:", followed by a checklist of 17 conditions. Of these conditions, 8 were considered to be of relevance to the development of foot problems and were included in the analysis (arthritis, diabetes, heart disease, hypertension, stroke, osteoporosis, depression and anxiety/nervous disorder).

2.5. Foot problems

At both surveys, participants were asked if they had problems with one or both feet in the last 12 months. Participants could select (i) never; (ii) rarely; (iii) sometimes, or; (iv) often. Those who responded "never" or "rarely" were categorised as not having foot problems, whereas those who responded "sometimes" or "often" were categorised as having foot problems. Cross-tabulating baseline and follow-up frequencies of foot problems enabled the formation of four groups of participants: (i) those who reported no foot problems at baseline or follow-up ("no foot problems"); (ii) those who reported no foot problems at baseline but who reported foot problems at follow-up ("new foot problems"); (iii) those who reported foot problems at both baseline and follow-up ("persistent foot problems"), and (iv) those who reported foot

problems at baseline but not at follow-up ("resolved foot problems").

2.6. Statistical analysis

All analyses were performed with SPSS 14.0 (SPSS Inc., Chicago, IL, USA) and STATA 10 (STATA Corp., College Station, TX, USA). Continuous data were explored for normality prior to inferential analysis, and none required transformation. For the cross-sectional analysis, differences in age, height, weight, BMI and major medical conditions between those with and without foot problems at baseline were assessed using independent samples t-tests for continuously scored variables, and chi-squared tests and unadjusted odds ratios for dichotomous variables. With the exception of height and weight, all variables found to be significantly associated with foot problems ($p < 0.05$) were then simultaneously entered into a multivariate logistic regression model, and adjusted odds ratios (OR) and 95% confidence intervals (CI) for reporting foot problems (compared with not reporting foot problems) were calculated. Height and weight were not included in the model due to the inclusion of BMI.

For the prospective analysis, the same approach was undertaken to compare those with no foot problems *versus* new foot problems, and those with persistent foot problems *versus* resolved foot problems, with corresponding relative risks (RR) and 95% CIs calculated using the log binomial model [22]. In addition to major medical conditions, the percentage change in BMI from baseline to follow-up was calculated and divided into tertiles, and entered into the logistic regression models as a dichotomous variable (i.e. upper tertile *versus* lower and middle tertiles combined).

3. Results

3.1. Response rate, comparison of responders and non-responders, and missing data

Of the 10,434 participants at baseline, 7153 (69%) completed the 6 year follow-up. Non-responders to the 6 year follow-up ($n = 3281$) were slightly older (75.6 ± 1.5 years *versus* 75.2 ± 1.4 years; $p < 0.001$), weighed slightly less (64.6 ± 12.6 kg *versus* 65.5 ± 11.4 kg; $p < 0.001$), had a slightly lower BMI (25.1 ± 4.8 kg/m^2 *versus* 25.3 ± 4.3 kg/m^2; $p = 0.05$), and had a higher prevalence of diabetes (9.4% *versus* 6.5%; $p < 0.001$), heart disease (16.1% *versus* 12.0%; $p < 0.001$), stroke (4.9% *versus* 1.8%; $p < 0.001$), depression (10.0% *versus* 5.0%; $p < 0.001$) and anxiety/nervous disorder (7.6% *versus* 4.7%; $p < 0.001$). However, there were no significant differences between non-responders and responders in relation to the prevalence of reported foot problems (27.1% *versus* 25.5%; $p = 0.05$), osteoarthritis (41.2% *versus* 42.1%; $p = 0.40$), hypertension (33.3% *versus* 33.9%; $p = 0.54$) or osteoporosis (13.5% *versus* 12.1%; $p = 0.05$).

Of the 10,434 participants at baseline, 9486 (91%) answered the question relating to foot problems. Participants were excluded if they had missing data for any of the covariates ($n = 1427$), including weight and height data, which were missing for 489 and 316 participants, respectively. Complete data for the cross-sectional analysis were therefore available from 8059 participants (85% of those who answered the foot problem question).

Of the 7153 participants at follow-up, 6195 (87%) answered the question relating to foot problems. Participants were excluded if they had missing data for any of the covariates ($n = 1450$), including weight and height data, which were missing for 516 and 220 participants, respectively. Complete data for the prospective analysis (i.e. from both baseline and follow-up) were therefore available from 4745 participants (78% of those who answered the foot problem question).