Living with urinary incontinence: a longitudinal study of older women

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Abstract

Background: urinary incontinence carries major social burden and considerable costs for health care systems.

Objective: the aim of this study was to investigate changes in continence status among a large cohort of older women, and to identify factors associated with incidence of incontinence in later life.

Subjects: participants of the Australian Longitudinal Study of Women’s Health (ALSWH), aged 70–75 years in 1996 and who have completed four health surveys over the past 10 years.

Methods: continence status across four survey periods, spanning 9 years, were defined according to women’s reports of ‘leaking urine’ at each survey. Generalised estimating equation (GEE) models were used in longitudinal analyses of the factors associated with changing continence status over time.

Results: this study presents longitudinal data on the prevalence and incidence of incontinence from a large cohort of older women, over 9 years of follow-up. Over this time, 14.6% (95% CI 13.9–15.3) of the women in the study who had previously reported leaking urine ‘rarely’ or ‘never’ developed incontinence, and 27.2% (95% CI 26.2%, 28.3%) of women participating in Survey 4 (S4) in 2005 reported leaking urine ‘sometimes’ or ‘often’ at that survey, with women being twice as likely to report incontinence at S4 as they were 6 years earlier. Longitudinal models demonstrated the association between incontinence and dementia (P < 0.001; OR = 2.34; 95% CI 1.64, 3.34), dissatisfaction with physical ability (P < 0.001; OR = 1.70; 95% CI 1.52, 1.89), falls to the ground (P < 0.001; OR = 1.23; 95% CI 1.13, 1.33), BMI (P < 0.001; OR = 2.18; 95% CI 1.70, 2.80 for obese), constipation (P < 0.001; OR 1.46; 95% CI 1.34–1.58), urinary tract infection (P < 0.001; OR 2.07; 95% CI 1.89–2.28), history of prolapse (P ≤ 0.001; OR = 1.53; 95% CI 1.35, 1.74) and prolapse repair (P = 0.002; OR = 1.23; 95% CI 1.08, 1.40). Stroke (P = 0.01), parity (P = 0.017) and hysterectomy (P = 0.026) and number of visits to the general practitioner (P = 0.040) were less strongly associated with incontinence in the final longitudinal model. Incontinence was not significantly associated with area of residence (P = 0.344), education (P = 0.768), smoking (P = 0.055), diabetes (P = 0.072), attending support groups (P = 0.464) or attending social groups (P = 0.022).

Conclusion: strong associations between BMI, dysuria and constipation indicate key opportunities to prevent incontinence among older women.

Keywords: incontinence, urinary, longitudinal, women quality of life, elderly

Introduction

Urinary incontinence is a common problem in our community, and it is estimated that almost two million community-dwelling women in Australia have problems with urinary incontinence [1]. Incontinence is common among older people, and among women [2, 3], and is a major factor leading to placement in nursing homes [4]. This is not surprising in view of the fact that urinary incontinence is an integral part of many disease complexes common in elderly women and the fact that ageing changes within the lower urinary tract make a significant contribution to continence status [5, 6].

In the 1996 baseline surveys of the Australian Longitudinal Study of Women's Health (ALSWH), 36% of mid-age women (45–50) and 35% of older women (70–75) reported leaking urine ‘rarely’, ‘sometimes’ or ‘often’ [7]. More in-depth surveys of these women have identified cross-sectional associations between incontinence severity and body mass.
index (BMI), other urinary symptoms, smoking, hormone replacement therapy and hysterectomy [8]. These surveys also showed that many women who had incontinence were employing methods to prevent incontinence that may have other detrimental health outcomes. For example, many women reduced their fluid intake [8] and many avoided physical activity [9] in an attempt to reduce their symptoms.

While these findings emphasise the importance of the problem of incontinence, because they are cross-sectional in nature, they provide little detail on the incidence, natural history, risks and adverse health outcomes associated with the problem of incontinence. This current study considers data collected repeatedly over 10 years from the ALSWH. These data provide an opportunity to explore longitudinal changes among women with incontinence and to explore those factors that place women at greatest risk of developing incontinence.

**Methods**

Women in this study were from the oldest cohort of the ALSWH. The women were aged 70–75 years at baseline (Survey 1) in April 1996 and were randomly sampled from the Australian universal health insurance (Medicare Australia) database. Women from rural and remote locations were deliberately oversampled. These older women have completed four surveys at 3-year intervals (1996, 1999, 2002 and 2005). More details of the study have been published elsewhere [10–12] and are available from www.alswh.org.au. Women provided written informed consent at the time of survey completion for their data to be linked to earlier surveys. This project was cleared by the University of Newcastle Human Research Ethics Committee.

At each of the four surveys (S1–S4), women were asked to report whether they experience leaking urine either ‘never’, ‘rarely’, ‘sometimes’ or ‘often’ in the last 12 months. They were also asked similar questions about other symptoms including urine that burns or stings, constipation and prolapse of vagina, bladder or bowel. Comorbid conditions were measured at S1–S4 as self-reported doctor diagnoses including diabetes, heart disease, hypertension, stroke, thrombosis, low iron level, osteoporosis, cancer, depression, anxiety and Alzheimer’s/dementia. Past gynaecological procedures including hysterectomy, oophorectomy and prolapse repair were assessed at each survey. BMI was calculated from self-reported weight and height. Other variables used to measure health and social circumstances included area of residence (urban, rural or remote and classified according to postal code), education (dichotomised as primary education only; secondary and higher), marital status, parity (categorised as none, once, twice and three times or more), provision of care for children and/or for others with disability (yes, no), need for help with daily tasks (yes, no) and the number of visits to a general practitioner in the past 12 months (dichotomised as less than 5, and 5 or more). Full questions are available at www.alswh.org.au

Deaths were ascertained annually from the National Death Index with matching on name, address and date of birth information [14]. All phone calls and correspondence notifying of death or withdrawal from the study were also logged by the study office and compared with the National Death Index notifications to ensure completeness of follow-up for mortality.

**Statistical analyses**

Data analysis was performed using SAS V9.1 [15]. Generalised estimating equations (GEE) [16] were used to identify the longitudinal association between incontinence and other covariates and across time. In these analyses, the dependent variable was the report of leaking urine at each survey (sometimes/often vs. rarely/never), and explanatory variables were health and social factors as measured at each survey. Since a large number of factors of interest were not measured at S1, only data for S2, S3 and S4 were included in the models reported. However, separate analyses that included S1 data for those variables measured at S1 were also undertaken. Explanatory variables were selected after bivariate analyses of each factor of interest at each time point, and by selecting those with a P-value of 0.05 or less. The P-value was set to 0.005 for determining significance in the final model (this P-value was chosen due to the influences of the large sample size and power on statistical significance) [17].

Where explanatory variables were highly correlated with each other, the item with the strongest association with incontinence was selected for multivariate analysis. Data for women who died or withdrew were included in the GEE models up to the point of censorship. An unstructured correlation structure was used to adjust for the correlation between repeated measurements.

**Results**

In 1996, 12,432 women aged 70–75 years completed S1 and 7,158 of these women completed S4 in 2005 (58% of original cohort); however, 257 of these 7,158 women could not be classified according to their continence status. Between S1 and S4, 1,864 women died, and a further 3,410 women withdrew from the study.

Figure 1 shows women’s reports of leaking urine ‘sometimes’ or ‘often’ in the past 12 months at each survey (S1–S4). At S1, 20.7% (95% CI 20.1%, 21.5%) of women reported that they had experienced leaking urine ‘sometimes’ (14.3%; 95% CI 13.8%, 15.0%) or ‘often’ (6.4%; 95% CI 6.0%, 6.8%). The overall prevalence of leaking urine for the 9,488 surviving women who responded to S2 was 14.2% (95% CI 13.5–14.9%), and the proportions reporting this problem among surviving respondents at S3 and S4 was 19.1% (95% CI 18.3%, 20.01%) and 27.2% (95% CI 26.2%, 28.3%), respectively. However, of the 2,578 women who reported leaking urine at S1, only 34% continued to report this problem.
Living with urinary incontinence

Figure 1. Reports of leaking urine ‘sometimes’ or ‘often’ in the past 12 months; N = 12,432.

at S2 and only 113 women consistently reported leaking urine on every survey (S1–S4).

The proportion reporting a new (incident) case of incontinence (leaking urine ‘sometimes’ or ‘often’ in the past 12 months among women who had reported leaking urine ‘never’ or ‘rarely’ on all previous surveys) was 4.7% (95% CI 4.3–5.1) at S2, 6.7% (95% CI 6.1–7.3) at S3 and 9.3% (95% CI 8.48–10.1) at S4 (see Figure 1). In total, 14.6% (95% CI 13.9–15.3) of the 9,397 women who reported leaking urine ‘never’ or ‘rarely’ at S1 subsequently reported leaking urine ‘sometimes’ or ‘often’ at S2, S3 or S4.

The results of the GEE model (odds ratios and 95% CI) are shown in Table 1. In this multivariable model, women were almost twice as likely to report incontinence at S4 as they were at S2 (\(P < 0.001; \text{OR} = 1.94; 95\% \text{CI} 1.79–2.09\)). In the final model, incontinence was strongly associated with physical conditions such as dementia (\(P < 0.001; \text{OR} = 2.34; 95\% \text{CI} 1.64, 3.34\)), physical ability (\(P < 0.001; \text{OR} = 1.70; 95\% \text{CI} 1.52, 1.89\) for dissatisfied), falls to the ground (\(P < 0.001; \text{OR} = 1.23; 95\% \text{CI} 1.13, 1.33\)), BMI (\(P < 0.001; \text{OR} = 2.18; 95\% \text{CI} 1.70, 2.80\) for obese), constipation (\(P < 0.001; \text{OR} = 1.46; 95\% \text{CI} 1.34–1.58\)), urinary tract infection (UTI, \(P < 0.001; \text{OR} = 2.07; 95\% \text{CI} 1.89–2.28\)), history of prolapsed bladder or bowel (\(P < 0.001; \text{OR} = 1.53; 95\% \text{CI} 1.35, 1.74\)) and prolapse repair (\(P = 0.002; \text{OR} = 1.23; 95\% \text{CI} 1.08, 1.40\)). Stroke (\(P = 0.01\)) and hysterectomy (\(P = 0.026\)) and number of visits to the general practitioner (\(P = 0.040\)) were less strongly associated with incontinence in the final longitudinal model. Incontinence was not significantly associated with area of residence (\(P = 0.34\)), education (\(P = 0.768\)), smoking (\(P = 0.055\)), diabetes (\(P = 0.072\)), attending support groups (\(P = 0.464\)) or attending social groups (\(P = 0.022\)). The alternative GEE model including S1 data provided similar results for those predictor variables that were measured at S1 (data not shown).

Discussion

This study presents longitudinal data on the prevalence and incidence of incontinence from a large cohort of older women, over 9 years of follow-up. Around 27% of women participating in S4 reported leaking urine ‘sometimes’ or ‘often’ at that survey, with women being twice as likely to report incontinence at this survey as they were 6 years earlier. However, while the prevalence of incontinence tended to increase as women aged, the reporting of leaking urine was not consistent for all surveys with some women who reported leaking urine on one survey reporting that this was ‘rarely’ or ‘never’ a problem on the next survey. This was particularly true for women who reported leaking urine at S1. These longitudinal changes could reflect inconsistencies in reporting, or true variation in the continence status over time.

Few previous studies have investigated changes in reports of incontinence over time. The MRC incontinence study reported an annual incidence rate of 6.3% among men and women aged 40 years and over [18]. A Viennese study involving a wider age range (ages 20–84 years) reported a mean annual incidence of urinary incontinence of 3.9% over 6.5 years of follow-up, with the highest rate (7.3%) reported among those aged 70 years or older. The study also reported a remission rate of 2.9% per year, with no clear age dependence [19]. Similarly, a Swedish study of women aged 65 years and below reported a baseline prevalence of urinary incontinence of 23.6%, a mean annual incidence rate of 2.9% and an annual remission rate of 5.9% [20]. A Danish longitudinal
study reported an incontinence prevalence of 28.5%, and a remission rate of 27.8% within 1 year of follow-up [21]. The authors of these studies conclude that urinary incontinence is not necessarily progressive and can be dynamic.

GEE models indicate strong longitudinal associations between incontinence and physical conditions such as dementia, physical ability, falls to the ground, constipation, UTI, history of prolapsed bladder or bowel and prolapse repair \((P = 0.002; \text{OR} = 1.23; \text{95}\% \text{CI } 1.08, 1.40)\). Falls to the ground may be a consequence of incontinence (due to rushing to reach the toilet in time) but are likely to also be related to a common underlying cause such as general weakness, conditions such as stroke, dementia, arthritis and Parkinson’s disease or other aspects of frailty. Other studies have also noted a relationship between the onset of incontinence and falls and between incontinence and chronic conditions and functional impairment, and suggest that understanding the relationship between functional impairment and urinary incontinence is important for the prevention, treatment and management of urine loss [22, 23].

Strong associations between BMI, dysuria and constipation have also been found in other studies [24] strengthening the fact that they might indicate key opportunities to prevent incontinence. Dysuria is a non-specific symptom that may indicate UTI. An intensive study of the association between microbiologically confirmed UTI and urinary incontinence found that, after adjustment for the acute period, incontinence was higher among women who experienced UTIs compared with those who did not [25].

Unlike the findings from cross-sectional studies involving younger women, parity was not strongly associated with the development of incontinence among older women in this study. At these older ages, other gynaecological factors, including gynaecological surgery, appear to be stronger predictors of later continence problems.

A major strength of this study was the use of a large, national sample of community-dwelling, relatively healthy women. Previous studies of continence have tended to be in defined populations [26], involving younger cohorts of women and conducted over shorter periods of time [18–21, 27, 28].

Using a cohort of older women allowed us to focus on a population which is growing in size as the population as a whole ages. A further strength is the use of longitudinal data which has allowed us to determine new cases of incontinence (incident cases) and to identify temporal relationships between incontinence and associated disability.

A major limitation of this study is the use of a single item to report leaking urine. It is also a problem that, although S1 respondents were fairly representative of Australian women, those who continued in the study were healthier and of higher socioeconomic status than the general population and than

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**Table 1. Factors associated with leaking urine (final longitudinal model)**

<table>
<thead>
<tr>
<th>Explanatory variable (reference)</th>
<th>Odds ratio</th>
<th>95% CI</th>
<th>P-value</th>
</tr>
</thead>
<tbody>
<tr>
<td>Time 2002 (1999)</td>
<td>1.26</td>
<td>1.17</td>
<td>1.35</td>
</tr>
<tr>
<td>Time 2005 (1999)</td>
<td>1.94</td>
<td>1.79</td>
<td>2.09</td>
</tr>
<tr>
<td>Area of residence Rural/remote (urban)</td>
<td>1.05</td>
<td>0.95</td>
<td>1.15</td>
</tr>
<tr>
<td>Diabetes Yes (no)</td>
<td>1.13</td>
<td>0.99</td>
<td>1.28</td>
</tr>
<tr>
<td>Dementia Yes (no)</td>
<td>2.34</td>
<td>1.64</td>
<td>3.34</td>
</tr>
<tr>
<td>Stroke Yes (no)</td>
<td>1.29</td>
<td>1.07</td>
<td>1.55</td>
</tr>
<tr>
<td>Fall to the ground Yes (no)</td>
<td>1.23</td>
<td>1.13</td>
<td>1.33</td>
</tr>
<tr>
<td>Number of visits to a general practitioner in the past 12 months Five times or more</td>
<td>1.15</td>
<td>1.01</td>
<td>1.31</td>
</tr>
<tr>
<td>Three or four times or more (none, one or two)</td>
<td>1.05</td>
<td>0.92</td>
<td>1.21</td>
</tr>
<tr>
<td>BMI category Obese</td>
<td>2.18</td>
<td>1.70</td>
<td>2.80</td>
</tr>
<tr>
<td>Overweight</td>
<td>1.62</td>
<td>1.27</td>
<td>2.05</td>
</tr>
<tr>
<td>Underweight (acceptable weight)</td>
<td>1.39</td>
<td>1.10</td>
<td>1.75</td>
</tr>
<tr>
<td>Satisfaction with physical ability Dissatisfied to some degree</td>
<td>1.70</td>
<td>1.52</td>
<td>1.89</td>
</tr>
<tr>
<td>Somewhat satisfied (completely/ very satisfied)</td>
<td>1.39</td>
<td>1.26</td>
<td>1.53</td>
</tr>
<tr>
<td>Urine that burns or stings Yes (no)</td>
<td>2.06</td>
<td>1.86</td>
<td>2.28</td>
</tr>
<tr>
<td>Constipation Yes (no)</td>
<td>1.46</td>
<td>1.34</td>
<td>1.58</td>
</tr>
<tr>
<td>Parity Three or more births</td>
<td>1.09</td>
<td>0.91</td>
<td>1.31</td>
</tr>
<tr>
<td>Twice (none)</td>
<td>0.98</td>
<td>0.80</td>
<td>1.19</td>
</tr>
<tr>
<td>Once (none)</td>
<td>0.83</td>
<td>0.65</td>
<td>1.06</td>
</tr>
<tr>
<td>Prolapse Yes (no)</td>
<td>1.53</td>
<td>1.35</td>
<td>1.74</td>
</tr>
<tr>
<td>Prolapse repair Yes (no)</td>
<td>1.23</td>
<td>1.08</td>
<td>1.40</td>
</tr>
<tr>
<td>Hysterectomy Yes (no)</td>
<td>1.12</td>
<td>1.01</td>
<td>1.24</td>
</tr>
</tbody>
</table>

BMI = body mass index.

*Only data for S2, S3 and S4 were included in the models since a large number of factors of interest were not measured at S1.
respondents who dropped out [29], suggesting that our prevalence and incidence estimates may be low.

**Key points**

- Urinary incontinence in women is common.
- The prevalence of urinary incontinence increases with age.
- Urinary incontinence is a dynamic condition.
- Urinary incontinence is associated with increased BMI, so it might be modifiable.
- Continence promotion should be considered within falls prevention interventions.

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**Conflicts of interest**

No author declares a conflict of interest with this research.

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