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Prevalence and Correlates of Urinary Incontinence Among Older, Community-Dwelling Women

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Abstract

OBJECTIVES—As the aging population in the United States grows, the investigation of urinary incontinence (UI) issues becomes increasingly important, especially among women. Using data from the California Health Interview Survey (CHIS), we sought to determine the prevalence and correlates of UI among an ethnically diverse population of older, community-dwelling women.

METHODS—5,374 female Californians aged 65 or older participated in a population-based, cross-sectional random digit dialing telephone survey. The CHIS 2003 adult survey included one question for Californians aged 65+ about UI. Additional information collected via the self-reported survey included demographics (age, race/ethnicity, education, and household income); general health data (self-reported health status, height and weight, fall history, and special equipment needs); medical co-morbidities; and health behaviors (tobacco usage, physical activity, and hormone replacement therapy (HRT)).

RESULTS—The estimated state-wide female prevalence rate for UI was 24.4%. Prevalence rates increased with age. UI was significantly associated with poorer overall health (adjusted OR 3.43, $p < 0.001$), decreased mobility (OR 1.81, $p = 0.004$), current use of HRT (OR 1.72, $p < 0.001$), being overweight or obese (OR 1.60, $p < 0.001$), a history of falls (OR 1.53, $p = 0.002$), and a history of heart disease (OR 1.38, $p = 0.010$). After adjusting for all health factors, UI was not found to have any significant association with level of education, household poverty status, or smoking status.

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Karyn S. Eilber is a speaker for Astellas and a consultant for American Medical Systems. All other authors have no conflicts of interest.

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All authors had access to the data and a role in writing the manuscript.

CONCLUSIONS—UI prevalence among this diverse group of older community-dwelling Californian women parallels that of other population-based studies. CHIS demonstrated that poor health, increased BMI, falls, and decreased mobility are strongly correlated with UI.

Keywords

urinary incontinence; risk factors; community-dwelling women; co-morbidities

INTRODUCTION

The burden of urinary incontinence (UI) among older individuals in the United States (U.S.) is immense,¹ with estimates of the prevalence of UI for older, community-dwelling women ranging up to 55%.² A population-based study of Medicare beneficiaries found a baseline prevalence of UI at 41% in women, with an incidence rate of new-onset UI of 29%.³ The number of individuals over the age of 65 is expected to grow from 13% of the U.S. population in 2010 to 20.2% by 2050.⁴ Given this estimate, the number of individuals suffering from UI will correspondingly increase.

While prevalence rates of UI demonstrate a wide range of values between various studies, correlates of UI show even greater variation. Previous cross-sectional studies have linked UI to smoking, poor general health status, chronic diseases such as diabetes and asthma, body mass index (BMI), cognitive decline, decreased physical function, and numerous other medical and social conditions.^{5–10} Nonetheless, factors contributing to UI remain relatively poorly understood. In order to quantify the burden of UI among a heterogeneous population of older, community-dwelling Californians, we sought to analyze the prevalence of UI in this group of older women and across relevant demographic and medical factors through the use of the California Health Interview Survey (CHIS).

MATERIALS AND METHODS

Sample

CHIS is a result of the collective efforts of the California Department of Health Services, the Public Health Institute, and the University of California, Los Angeles Center for Health Policy Research.¹¹ The survey began in 2001 and is conducted every two years in order to provide population-based estimates of various health-related measures within the general population of California.¹¹ It is a random digit dialing telephone interview, with supplemental sampling of certain ethnic groups to ensure an accurate representation of the Californian population. Self-reported data was collected by professional interviewers using a computer-assisted telephone interview system with interviews conducted in the respondent's native language. All CHIS files are available for public use. We chose the unique 2003 CHIS dataset for this study because it was the only year to date that asked about UI. The following question was asked specifically of all survey respondents over the age of 65: "In the past 30 days, have you been incontinent, that is unable to hold or control your urine more than once?"¹² Responses were recorded as yes or no; a yes response was coded as the presence of UI.^{11, 12}

The 2003 dataset was conducted from August of 2003 to February of 2004. After dividing the state into 41 sampling strata either by individual county or by a combination of multiple smaller counties, households were identified for contact and one adult (age 18 or older) was randomly selected from each household to complete the survey.¹¹ A total of 463,025 telephone numbers were identified for sampling and attempted survey administration, with the goal of completing 40,000 adult interviews statewide. The 2003 CHIS had an overall response rate of 33.5%.¹¹

Measures

Covariates included in this analysis consisted of socio-economic variables, along with data available regarding overall health and common medical conditions. Demographic information collected and considered in this analysis included age, gender, race and ethnicity, citizenship status, primary language spoken at home, education, employment status, and household income as a percentage of the Federal Poverty Level (FPL). General health data analyzed consisted of self-reported measures of personal perception of health status on a 5-point scale (excellent to poor), height, weight, fall history, need for special equipment, and medical insurance status. Cases were rated as overweight or obese where calculated BMI was $\geq 25 \text{ kg/m}^2$. Data regarding history of hysterectomy was also assessed for female subjects, although 38% of female subjects were missing data in this category, as questions were added two months after study initiation due to study design errors. Health behaviors analyzed included smoking status, participation in regular walking activities, medical care received in the past year, and use of hormone replacement therapy.

Statistical Analysis

All analyses were performed using Statistical Analysis Software (SAS) Version 9.2 (Cary, NC) using statistical procedures specific for survey data analysis methods of weighted data. Data weights had previously been determined by the CHIS developers to compensate for a variety of factors, some directly resulting from the design and administration of the survey. The sample is weighted to represent the non-institutionalized population within each sampling stratum.¹³ Analysis began with an initial review of data distributions and summary statistics. Significant associations between UI and demographic and medical variables were tested by a χ^2 test. Odds ratios (OR) were determined by logistic regression. In the multi-variable logistic regression modeling, interactions between age, race, and ethnicity were also considered. Continuous measures (age, % FPL, and number of doctor visits for medical care) were stratified into approximate tertials after initial data review. Most missing data due to respondent non-response had previously been imputed for the entire CHIS cohort through hierarchical sequential hotdecking with donor replacement, per the original CHIS protocol study design.^{12, 14} For instances where data could not be imputed due to the large number of missing observations due to survey error (e.g. hysterectomy status), missing observations were included in all statistical analysis and classified as a unique category. For all statistical testing, the significance level was set at $p < 0.05$.

RESULTS

The CHIS 2003 survey conducted 42,044 adult interviews, with 5,374 of those interviews conducted in women aged 65 or older (12.7% of the study population). The 5,374 subjects responding to the UI question corresponded to a weighted sample of 2,132,649 non-institutionalized Californian women which is consistent with totals estimated by the 2000 Census.^{26, 27} Table 1 describes the characteristics of the study population. The estimated comorbidities of heart disease (21.4%) and stroke (9.2%) also are consistent with other studies of California's senior population for 2003.²⁸

Overall, 24.41% of older women reported UI in the past 30 days. Prevalence was found to increase with age; 31.86% of women over age 80 reported incontinence compared to 20.16% of women ages 65–72. Weighted prevalence rates for each demographic variable can be found in Table 2.

General health characteristics found to have a higher prevalence of UI included self-reported poor or fair general health (compared to excellent overall health), being overweight or obese, falling more than once in the past 12 months, or having limited mobility requiring special equipment or help with daily activities (Table 2). Medical co-morbidities found to have a higher prevalence of UI among study participants included heart disease, any cancer diagnosis, or stroke in unadjusted analysis, although these factors were no longer significant predictors in the full model after adjusting for all factors. Women who had a hysterectomy had a higher incidence of UI than women who did not (27.15% vs. 22.66%) in univariate analysis, but there was no increased risk in the full adjusted statistical model ($p=0.6700$). Data was missing regarding hysterectomy status for 38% of respondents due to survey sampling errors which were corrected two months after data collection had begun, and for the purposes of this study, cases were analyzed with missing as a unique category. However we found no major differences in our results when these cases were either excluded or imputed using multiple imputation methods¹⁵ (results not shown). Health behaviors found to have an increased prevalence of UI include the use of hormone replacement therapy (higher among current users and former users compared to those who never used), and amount of medical care received in the past year (higher for those reporting more medical visits in the past year compared to those with fewer medical visits).

Univariate analysis demonstrated the following demographic variables to be independent risk factors for UI in the past 30 days: age over 80 years (OR 1.85), Latino race/ethnicity (OR 1.52), less than a high school diploma education level (OR 1.50), and household income of 0–199% of the FPL (OR 1.31). General health characteristics found to be independent risk factors for UI in the past 30 days included: poor (OR 4.57) or fair (OR 2.52) self-reported health, obesity (OR 1.26), falling to the ground more than once in the past 12 months (OR 2.71), and needing special equipment or help with daily activities (OR 3.91). Complete results of the univariate analyses can be found in Table 2.

Multi-variable logistic analysis was performed to account for basic demographic information including age, race/ethnicity, and household income as a percentage of FPL. General health characteristics including self-reported health status of only fair (OR 1.79) or poor (OR 2.73),

obesity (OR 1.60), history of falls (OR 1.53), and needing equipment or help with daily activities (OR 1.81) all remained significant correlates. Having a history of heart disease (OR 1.38) remained a significant co-morbidity. Health behaviors significantly associated with UI included past or current use of hormone replacement therapy in women (OR 1.24 and 1.72, respectively, Table 2). Many interactions were tested across the variables studied, but none were found to be statistically significant.

DISCUSSION

Use of the CHIS 2003 adult survey allowed for an evaluation of the prevalence and correlates of UI among a large population of non-institutionalized older women. Given California's wide racial, ethnic, and socioeconomic diversity, our finding strengthen those of other studies by increasing generalizability, particularly in areas of controversy with regard to risk factors. The overall prevalence rates of incontinence among Californian women are similar to results reported in previous cross-sectional studies.^{2, 7} In a literature review conducted by Thom et al. of population-based studies from around the world conducted from 1971–1997, the prevalence of incontinence was reported as high as 55.1% among adult women.² A review by Hunskaar et al. analyzing population-based studies of UI in multiple countries over a similar time frame found the prevalence among women over age 75 to be as high as 59%; this review took into account how the prevalence rates changed depending on the definition of reported symptom severity.¹⁶

We found that individuals who self-reported excellent overall health had a significantly decreased prevalence of UI than individuals reporting fair or poor health (OR 1.79 and OR 2.73, respectively). The relationship between poor self-reported overall health and a significantly increased prevalence of urinary incontinence was previously described by Brown et al in a population-based sample of women aged 65 and older. Women with poor overall health had a 40–70% increase in the prevalence of UI compared to women who did not have poor overall health.⁵ This is similar to the results demonstrated through our study.

Our results also showed a significant association between a history of falling to the ground more than once in the past 12 months and incontinence (OR 1.53). This relationship has been examined in previous studies, with Tinetti et al describing an increased risk of falls among adults who experienced UI (RR 1.5) in a population-based sample of community-dwelling adults aged 75 or older participating in the Yale Health and Aging Project.¹⁷ De Rekeneire et al. similarly described the presence of UI as being correlated with a risk of falling (OR 1.5) among men and women in a population-based sample of initially well-functioning, community-dwelling white and African American adults aged 70–79.¹⁸ In addition, Tromp et al. found that the presence of UI was associated with an increased risk of falling and recurrent falls (OR 1.6 and 2.1, respectively) in a prospective population-based study of community-dwelling men and women aged 65 and older living in the Netherlands.¹⁹ Although causation cannot be determined from the cross-sectional data available on this subject, it is likely that at least some falls occur in an older person's attempt to rush to the toilet to void.²⁰ In addition, people at risk of falling also lack the mobility needed to make it to the toilet on time.

We also identified an association between UI and a requirement for special equipment or help with activities of daily living (ADLs). Similar associations have been described previously.^{8, 9, 21} In a 2009 study of Mexican American (MA) and European American (EA) women aged 65 or older participating in the San Antonio Longitudinal Study of Aging, Markland et al found higher rates of dependency for ADLs among both the MA and EA cohorts who had UI compared with those who did not.²¹ In a 2008 study, using a stratified sample of African American and white male and female Medicare beneficiaries in Alabama, Markland et al. found that women reporting UI had greater difficulties performing ADLs.⁸ Smith et al. found that within a population-based sample of Latina women aged 60 or older who were members of community-based senior centers, women reporting UI were also more likely to report difficulty completing ADLs, although this relationship was not found to be significant in the final multi-variable analysis.⁹

In our multi-variable analysis, a history of heart disease was found to be significantly associated with UI. Previous research has found a similar correlation between heart disease and UI¹⁰, although other research has not been as conclusive.²² A more recent cross-sectional population-based study by Thom et al. found no significant association found between UI and heart disease in women as old as 69.²² This is consistent with previous population-based studies demonstrating no increased prevalence of UI among women over the age of 65 with heart disease.²³

Our results did not find an increased rate of UI among current smokers versus non-smokers, although former smokers were found to have a lower rate than either group in the unadjusted analysis. The association between smoking status and UI has been debated in prior studies. Hannestad et al. found that heavy smokers had an increased prevalence of UI, and severe UI was associated with both heavy and light smoking among female study participants.⁶ Tahtinen et al described UI to be approximately three times more common among smokers than non-smokers in a cross-sectional study of women in Finland.²⁴ In a 2010 study of older Latino men and women with UI, however, this correlation was not found to be significant.⁹ In our analysis, current smokers reported poorer general health than past and non-smokers, and given that only 7% of the study set reported being current smokers, this may explain why no significant direct association between smoking and UI was found. Further studies are necessary to determine the true impact of smoking on UI and to delineate the effect of quitting smoking on future risk of developing UI.

Data from 2003 CHIS showed that both past and current hormone replacement therapy (HRT) users had an increased risk of UI compared to those who had never used HRT (OR 1.24 and 1.72, respectively). The impact of using HRT in women and the prevalence and incidence of UI has been a widely debated topic. A recent randomized, blinded trial of HRT use in postmenopausal women aged 80 or younger and a recent literature review found that the use of HRT increases both the incidence and severity of UI, although the physiologic mechanisms behind this observation are still poorly understood.²⁵ It is possible that women taking HRT are more likely to seek medical care, and therefore more likely to admit to and be diagnosed with UI.

Strengths of this study include the large, heterogeneous sample of community-dwelling women with overall health characteristics consistent with previously published surveys for California's senior population.²⁸ However, we did encounter limitations with the UI analyses. The CHIS 2003 survey asked only one question regarding incontinence. This single question left us unable to distinguish between stress and urge incontinence, each of which has varying risk factors and prevalence rates. Also, this question was only asked in the CHIS 2003 survey and has not been repeated since, leaving us unable to compare prevalence rates and correlates across multiple years of survey administration. Because the CHIS 2003 is a population-based, cross-sectional study, we were unable to determine causality between the identified correlates and the prevalence of UI. In addition, the California-based study population may not necessarily be applicable to the U.S. as a whole or to other populations.

CONCLUSIONS

This large, population-based study conducted among an ethnically diverse group of older, community-dwelling Californian women, while taking into account multiple demographic and medical factors, supports previous findings regarding the prevalence and correlates of UI within an older, non-institutionalized population. Understanding common correlates of UI within this heterogeneous population, including overall health status, medical co-morbidities, and common health behaviors, may allow us to better identify community-dwelling women from multiple ethnic backgrounds who are at increased risk of developing UI.

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Table 1Study population characteristics, women age 65 ($n=5,374$).

	Unweighted (<i>n</i>)	Weighted (%)
<u>Age (yrs)</u>		
65–72	2008	35.88
72–80	1922	35.11
80+	1444	29.01
<u>Race/ethnicity</u>		
Non-Latino-White	4287	69.29
Asian (+Pac Isl)	342	11.44
Latino	299	10.61
African American	284	5.44
Other	162	3.21
<u>Education</u>		
< High school	841	25.76
High school diploma	1652	27.71
Some college	1639	26.07
College degree or higher	1242	20.47
<u>Federal poverty level</u>		
0–199%	1896	41.5
200–299%	1138	19.44
300% +	2340	39.06
<u>Self-reported health status</u>		
Excellent	698	11.16
Very good	1454	23.58
Good	1611	29.16
Fair	1080	23.97
Poor	531	12.12
<u>BMI</u>		
Underweight/Normal	2692	49.18
Overweight/Obese	2682	50.82
<u>Health conditions</u>		
Incontinence in past 30d	1388	24.41
Heart disease	1159	21.40
Any cancer diagnosis	1384	23.74
Cervical cancer	58	0.93
Hysterectomy	1506	44.09
Stroke	464	9.20
Fallen in past 12 mo	699	13.10

	Unweighted (n)	Weighted (%)
Assistance for daily activities	363	7.76
<u>Hormone replacement therapy usage</u>		
Never	2093	43.25
Past	2288	39.69
Current	993	17.05
<u>Smoking</u>		
Current smoker	443	7.44
Former smoker	1890	32.61
Never smoked	2973	59.74
<u>Medical care past year</u>		
0–2 visits	1564	28.06
3–5 visits	1753	34.56
6+ visits	2057	37.38

Table 2

Predictors of reported incontinence in past 30d among women >65 years.

	Univariate Analysis			Multi-variable Analysis		
	Weighted UI Prevalence Rate	OR	95% CI	p	OR	95% CI
<u>Age (yrs)</u>						
65–72	20.16	1.00	Reference		1.00	Reference
72–80	25.45	1.35	(1.10, 1.67)	0.0046	1.33	(1.08, 1.64)
80+	31.86	1.85	(1.48, 2.31)	<0.0001	1.86	(1.50, 2.32)
<u>Race/ethnicity</u>						
Non-Latino-White	25.77	1.00	Reference		1.00	Reference
Asian (+Pac Isl)	12.24	0.40	(0.27, 0.59)	<0.0001	0.50	(0.32, 0.76)
Latino	34.58	1.52	(1.08, 2.15)	0.0169	1.43	(0.98, 2.09)
African American	26.86	1.06	(0.74, 1.50)	0.7530	0.88	(0.61, 1.25)
Other	31.73	1.34	(0.82, 2.20)	0.2488	1.30	(0.77, 2.19)
<u>Education</u>						
< High school	29.81	1.50	(1.15, 1.96)	0.0026		
High school diploma	24.40	1.14	(0.93, 1.41)	0.2163		
Some college	24.78	1.17	(0.94, 1.44)	0.1624		
College degree or higher	22.04	1.00	Reference			
<u>Federal poverty level</u>						
0–199%	28.03	1.31	(1.08, 1.61)	0.0078		
200–299%	24.91	1.12	(0.92, 1.37)	0.2685		
300% +	22.86	1.00	Reference			
<u>Self-reported health status</u>						
Excellent	14.01	1.00	Reference		1.00	Reference
Very good	19.45	1.48	(1.12, 1.96)	0.0061	1.26	(0.94, 1.68)
Good	24.41	1.98	(1.52, 2.58)	<0.0001	1.61	(1.22, 2.12)
Fair	29.06	2.52	(1.82, 3.48)	<0.0001	1.79	(1.26, 2.54)
Poor	42.67	4.57	(3.27, 6.39)	<0.0001	2.73	(1.80, 4.16)

	Univariate Analysis			Multi-variable Analysis		
	Weighted UI Prevalence Rate	OR	95% CI	p	OR	95% CI
<u>BMI</u>						
Underweight/Normal	20.81	1.00	Reference		1.00	Reference
Overweight/Obese	29.86	1.62	(1.35, 1.94)	<0.0001	1.60	(1.32, 1.94)
<u>Health Conditions</u>						
Heart disease	35.38	1.87	(1.51, 2.31)	<0.0001	1.38	(1.08, 1.76)
Any cancer diagnosis	29.58	1.32	(1.11, 1.58)	0.0019	<i>not significant</i>	0.0948
Cervical cancer	33.04	1.46	(0.69, 3.05)	0.3210	<i>not significant</i>	0.7532
Hysterectomy	27.15	1.27	(1.03, 1.57)	0.0268	<i>not significant</i>	0.6998
Stroke	33.81	1.57	(1.18, 2.08)	0.0018	<i>not significant</i>	0.5045
History of falls	39.73	2.18	(1.70, 2.79)	<0.0001	1.53	(1.17, 2.01)
Assistance for daily activities	51.77	3.56	(2.57, 4.93)	<0.0001	1.81	(1.23, 2.67)
<u>Hormone replacement therapy</u>						
Never	23.27	1.00	Reference		1.00	Reference
Past	25.50	1.13	(0.94, 1.36)	0.2083	1.24	(1.02, 1.49)
Current	30.62	1.46	(1.17, 1.81)	0.0008	1.72	(1.36, 2.18)
<u>Smoking</u>						
Current smoker	27.53	1.18	(0.86, 1.62)	0.3012		
Former smoker	24.55	1.01	(0.86, 1.19)	0.8861	<i>not significant</i>	0.2162
Never smoked	24.34	1.00	Reference			
<u>Medical care past year</u>						
0-2 visits	18.59	1.00	Reference			
3-5 visits	25.50	1.50	(1.20, 1.87)	0.0003	<i>not significant</i>	0.1640
6+ visits	30.43	1.92	(1.55, 2.36)	<0.0001		