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Original Article

Urinary Incontinences Are Related with Fall and Fragility Fractures in Elderly Population: Nationwide Cohort Study

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Background: This prospective cohort study used nationwide claims data to investigate the incidence of fall and fragility fractures in association with urinary incontinence (UI) in the elderly, and to compare mortality after fragility fractures in elderly patients with or without incontinence. **Methods:** A total of 39,854 Korean adults (age, 66-80 years) who participated in health examinations between 2007 and 2012 and were followed up until 2015 were analyzed. Patient and comparison groups were classified according to the presence or absence of UI. The cumulative incidence of osteoporotic fragility fractures and falls in the 2 groups was assessed and compared. Hazard ratios for fragility fractures were calculated for the risk of UI in association with falls using a Cox proportional hazards model. **Results:** Of 39,854 elderly participants, 5,703 were classified in the UI group, while 34,151 were placed in the comparison group. Fall rates were significantly higher (20.8%) in the incontinence group than in the comparison group (4.7%) ($P<0.001$). Women in the incontinence group (13.9%) showed a significantly higher incidence of all types of fragility fractures than those in the comparison group (11.8%) ($P=0.005$). After adjustment for confounders, UI was not a significant risk factor for fragility fractures in men ($P=0.878$) or women ($P=0.324$). **Conclusions:** This study demonstrated that elderly women with UI have a significantly higher incidence of osteoporotic fragility fractures. In addition, elderly women are at higher risk for falls.

Key Words: Osteoporotic fractures · Risk factors · Urinary incontinence

INTRODUCTION

Urinary incontinence (UI) is an age-related condition, and is significantly associated with an increased risk of falls.[1-3] UI is not life-threatening, but it can greatly hurt the quality of life related to an increased risk of falls and fractures, and admission to long-term nursing care units.[4,5] The prevalence of UI in women aged over 65 years is estimated to be (30-50%), and the prevalence of falls (19-42%) with (33-50%) recurrent falls.[6]

Fragility fractures following a fall are widely recognized as a common major health care problem in the elderly population worldwide.[7-9] The incidences of

fractures and disability after fractures are increasing, because of increasing life expectancy, and other associated demographic changes.[10] Although UI in the elderly population and fall was proven in several studies,[1-4,11,12] studies regarding the relationship between UI and fragility fracture are still controversial. Therefore, we designed a prospective cohort study in the general population with UI using the nationwide health examination database to find the relationship between UI and fragility fractures in the elderly population.

The purposes of this prospective cohort study were to (1) investigate the fall and fragility fractures in the elderly with UI from 2007 to 2012; (2) assess UI as potential risk factor; and (3) compare the mortality after fragility fractures in the elderly patients with or without UI, using the nationwide claim data from the National Health Insurance Service (NHIS).

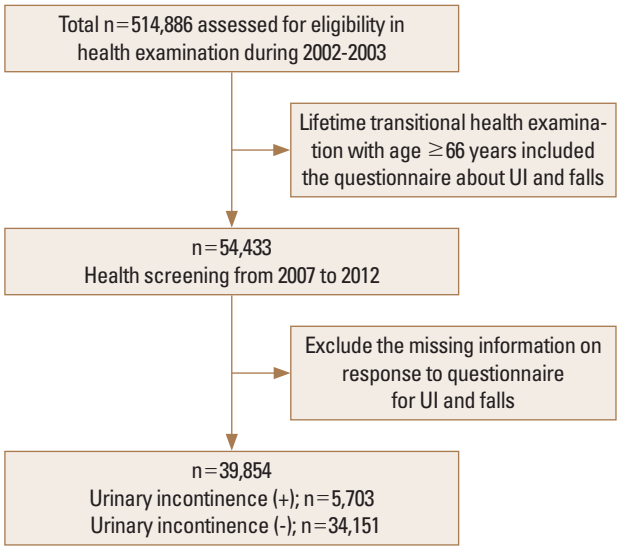

Fig. 1. Schematic showing subject involvement in the study. UI, urinary incontinence.

METHODS

1. Study population and follow-up

NHIS-National Health Screening Cohort (NHIS-HEALS) data was used to identify UI with falling, and to determine the risk of osteoporotic fracture incidence in elderly adults. In Korea, the NHIS programs provide legally compulsory health insurance that covers 97% of the population.[13] The total eligibility individuals (n=514,886) was a 10% random sample of 5.15 million NHIS beneficiaries aged 40 to 79 years in 2002, who participated in health examinations during 2002 to 2003. The cohort comprises 3 databases on the participants' insurance eligibility, medical treatments, health examination, and medical care institutions. In 2007, the NHIS introduced a new national health screening program that targets those at transitional ages (40- and 66-year-olds), infants, and children. Health screening for participants aged 66 years only includes a questionnaire to assess UI and falls.

As the lifetime transitional health examination for those aged 66 years old included the questionnaire about UI and falls, a total of 54,433 older adults who had health screening from 2007 to 2012 were identified. After excluding the missing information on response to questionnaire for UI and falls, finally, only actual study cohort (n=39,854) were included in this study, and were followed-up until 2015.

We defined the UI, and related fragility fractures and comorbidities using a claim data in the medical treatments database. The follow-up on the risk of fragility fracture from the year of taking the lifetime transitional health examination until December 31, 2015, was assessed from the NHIS hospital discharge records for the remaining 39,854 people prospectively (Fig. 1). Meanwhile, UI and other comorbidities had been observed from when they first occurred from 2002 until the fracture incidence (in the case of having no fracture, until death or censoring), prospectively.

All clinics and hospitals submitted claims data for outpatients and inpatient care, including diagnoses according to the third to sixth revision of the Korean Classification of Diseases, which was based on the International Classification of Diseases, Tenth Revision (ICD-10) in Korea, procedures, prescription records, and demographic information.

2. Definition of operational diagnosis of UI and falls

UI was defined by information from direct questionnaire and codes related to UI. Information on the occurrence of UI was collected using questionnaire that have been validated for implementation in an epidemiological surgery.[11] Patients who answered "yes" to the question, "Have you ever leaked urine or lost control of your urine?" were classified as overall UI. The codes related to UI can be collected based on the incontinence (ICD-10, N393 and N394), Bladder dysfunction (N32.8, N32.9, and N31), and other

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codes of urinary dysfunction (R300, R32, and R350).

The codes related to surgical procedure of UI included: 'HAR3976 (photoselective vaporization of the prostate)', 'HAR3975 (transurethral resection of prostate)', 'HAR3191 (transurethral ureteral dilatation)', 'HAR3663 (ureteroscopic surgery: urethral stent indwelling)', 'HAR3950 (prostatectomy)', 'HAR3960 (total prostatoseminal vesiculectomy)', 'HARZ-515 (prostatic urethral lift using the implantable device)', 'HAR3514 (transurethral ureteral meatotomy)', 'HAR3565 (operation for UI-transvaginal approach)', 'HAR3563 (operation for UI-foreign)', 'HAR3571 (cystostomy: operative)', 'HAR-3576 (percutaneous cystostomy)', 'HAR3663 (urethroscopic surgery: urethral stent indwelling)', 'HAR3665 (urethroscopic surgery: urethrotomy)', 'HAR3681 (repair of urethral stricture: Anterior)', 'HAR3682 (repair of urethral stricture: Perineal)', 'HAR3641 (urethral dilatation)'. Experience of falls was defined in cases of response as yes in the questionnaire.

3. Definition of the operational diagnosis of fragility fractures

Fragility fractures were identified on the basis of selected ICD-10 codes; hip (ICD-10, S72.0 [fracture of the femoral neck], S72.1 [pertrochanteric fracture], S72.2 [subtrochanteric facture], and 7 procedures [open reduction of fractured extremity-femur, closed pinning-femur, external fixation-pelvis/femur, closed reduction of fractured extremity-pelvis/femur, bone traction, skin traction, hemiarthroplasty-hip]); spine (S22.0 [fracture of the thoracic spine], S22.1 [multiple fractures of the thoracic spine], S32.0 [fracture of the lumbar spine], M48.4 [fatigue fracture of vertebra], and M48.5 [collapsed vertebra, NEC]); distal radius (S52.5 [fracture of the distal radius] and S52.6 [combined fracture of the distal radius/ulna]); humerus (S42.2 [fracture of the proximal humerus] and S42.3 [fracture of shaft of humerus]); and overall fractures.

4. Ethics approval

Because this study used data routinely collected by the NHIS, informed consent from the participants was not required, according to Korean law. This study was approved by the Institutional Review Board (IRB) (IRB no. 1041078-201607-HR-145-01). Access to the anonymized data was provided to the authors by the NHIS.

5. Data collection

Weight and height were measured to the nearest kilogram and centimeter, respectively, while participants wore light clothing without shoes. Body mass index (BMI) was calculated as weight in kilograms divided by the square of the height in meters (kg/m^2). Fasting serum glucose was assayed using enzymatic methods. Smoking history, alcohol use, physical activity, activities of daily living, depression, and difficulty of walking were reported via the questionnaire. Alcohol consumption per week was estimated by using information on the alcohol use frequency. The questionnaire for assessing the activities of daily living involved six questions that combine 4 items from the Korean Activity of Daily Living (K-ADL), and 2 items from the Korean Instrumental ADL (K-IADL) scales.[14] Memory impairment was measured by the Korean Prescreening Korean Dementia Screening Questionnaire, which is a tool with high validity and reliability for the diagnosis of early dementia.[15] Three selected questions from the Geriatric Depression Scale are used for individuals of ages 66 to screen for depression.[14] Health examination and data collection followed the standard protocol officially documented by the Ministry of Health and Welfare. The external quality validation process for clinical chemistry in participating hospitals was supervised by the Korean Association of Quality Assurance for Clinical Laboratories, and quality assessment was performed regularly.[16]

6. Medical risk factors at baseline

We generally considered individuals to have a known prevalent disease at baseline, when they visited a medical institution for a diagnosed disease at least once within 6 months before or within 2 months after the baseline health examination date, considering the disease undiagnosed at baseline. Medical risk factors were selected using 3- or 4-digit ICD-10 codes: cancers, C00-C97; chronic kidney disease (CKD), N18-N19; and osteoporosis, M80-M82.

7. Comorbidities

Three chronic diseases that increase the risk of fracture incidence were included as dummy variables, taking the value 1 if the diseases first occurred from 2002 until fracture occurrence, and 0 otherwise. Three chronic diseases were included: cancer (C00-C97), dementia (Alzheimer's disease, vascular dementia, Lewy body dementia, circum-

scribed brain atrophy, dementia as a side-effect of another disease, others not specified as dementia [F00/G30, F01, G31.82, G31.0, F02, F05.1, G23.1, F03]), and CKD (N18-N19).

8. Statistical analysis

We performed the descriptive statistics using frequency and percentage of total study population by 2 subgroups according to UI. The cumulative incidence rate of osteoporotic fracture was calculated by sex. Kaplan-Meier survival curves were used to examine the UI, and the risk of osteoporotic fracture. The hazard ratios (HRs) for the risk of fragility osteoporotic fracture were calculated using Cox proportional hazards models stratified by sex after activities of daily living (normal and abnormal, no for at least 1 ques-

Table 1. Demographic characteristics of urinary incontinence group and control group

Variables	Total	Urinary incontinence		*P*-value
		Yes	No	
n (%)	39,854	5,703 (14.3)	34,151 (85.7)	
Gender				<0.001
Male	20,943 (52.5)	3,467 (60.8)	17,476 (51.2)	
Female	18,911 (47.5)	2,236 (39.2)	16,675 (48.8)	
Body mass index (kg/m^2)	24.19±2.95	24.18±2.91	24.19±2.95	0.643
Smoking				NS
No	34,544 (86.7)	4,844 (84.9)	29,700 (87.0)	
Yes	5,310 (13.3)	859 (15.1)	4,451 (13.0)	
Alcohol				<0.001
No	25,458 (63.9)	3,301 (57.9)	22,157 (64.9)	
Yes	14,396 (36.1)	2,402 (42.1)	11,994 (35.1)	
Hemoglobin (g/dL)	13.72±1.41	13.86±1.43	13.70±1.40	NS
Fasting glucose (mg/dL)	102.90±25.38	103.30±25.42	102.80±25.37	0.199
Systolic blood pressure (mmHg)	128.47±15.35	127.80±15.10	128.60±15.39	NS
Chronic disease				
Dementia	2,716 (6.8)	515 (9.0)	2,201 (6.4)	<0.001
Cancer	6,857 (17.2)	1,181 (20.7)	5,670 (16.6)	<0.001
Chronic kidney disease	889 (2.2)	168 (3.0)	721 (2.1)	<0.001
Exercise				<0.001
No	11,059 (27.7)	1,398 (24.5)	9,661 (28.3)	
Walking more than 30 min for 1 week	14,080 (35.3)	2,008 (35.2)	12,072 (35.3)	
Moderate to severe activity for 1 week	14,715 (36.9)	2,297 (40.3)	12,418 (36.4)	
Memory impairment				<0.001
No	33,233 (83.4)	4,037 (70.8)	29,196 (85.5)	
Yes	6,621 (16.6)	1,666 (29.2)	4,955 (14.5)	
Depression				<0.001
No	31,457 (78.9)	3,209 (56.3)	28,248 (82.7)	
Yes	8,397 (21.1)	2,494 (43.7)	5,903 (17.3)	
Activities of daily living				<0.001
Good	38,262 (96.0)	1,217 (21.3)	32,934 (96.4)	
Poor	1,592 (4.0)	375 (6.6)	5,328 (15.6)	
Difficulty of walking				<0.001
No	39,166 (98.3)	5,563 (97.5)	33,603 (98.4)	
Yes	688 (1.7)	140 (2.5)	548 (1.6)	
History of falls				<0.001
No	37,052 (93.0)	4,517 (79.2)	32,535 (95.3)	
Yes	2,802 (7.0)	1,186 (20.8)	1,616 (4.7)	

NS, not significant.

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tion of 6), memory impairment (normal or abnormal, yes for at least 1 question of 3), difficulty of walking (yes or no), exercise (no or yes, walking more than 30 min for 1 week, or moderate to severe activity for 1 week), smoking status (current smoker or not), and alcohol consumption (no or yes: more than 1 day). We further adjusted for comorbid dementia, cancer, and CKD in the sensitivity analysis. Statistical definition for the censoring event was "death or no osteoporotic fracture" by the end of the study period, while complete event was the "day of osteoporotic fracture first occurred". All *P*-values were 2-sided (men and women). All analyses were conducted using the SAS version 9.4 software (SAS Institute, Cary, NC, USA).

RESULTS

1. Characteristics and fall history of the study population

Out of 39,854 elderly participants (20,943 men and 18,911 women), 5,703 persons (3,467 men and 2,236 women) were classified as the UI group, while 34,151 persons (17,476 men and 16,675 women) were the comparison group. BMI of all the participants were not different at 24.19±2.95 kg/m^2, 23.92±2.77 kg/m^2 in men and 24.49±3.10 kg/m^2 in women (P=0.634), respectively (Table 1). In the elderly population with UI, fall history was significantly higher (20.8%) in the elderly with UI group than the 4.7% in the comparison group (P<0.001) (Table 1).

2. Association between UI and fragility fractures

All types of fragility osteoporotic fractures (hip, spine, distal radius, and proximal humerus) in the UI group and comparison group were 477 (167 in men and 310 in women, 8.4%) and 2,706 (738 in men and 1,968 in women, 7.9%), respectively. Considering sex differences, only women in the UI group (13.9%) showed a significantly higher incidence of osteoporotic fractures than the comparison group (11.8%) (P=0.005) (Table 2). According to the individual fracture types, hip fracture is frequently of higher incidence in men and women of the UI group. However, the incidence of distal radius fracture in women was higher in the UI group (P=0.015). Other individual fractures in men, including spine, proximal humerus, and distal radius, were not different between the 2 groups.

3. Risk factors for fragility osteoporotic fracture

After adjustment of confounders, memory impairment (P<0.001) in men and women, difficulty of working in men (P=0.008) and women (P<0.001), lower exercise in women (P<0.001), heavy smoking in women (P=0.008) and in men (P<0.001), depression in men (P=0.007), and cancer in women (P=0.003) and in men (P=0.025) were significant risk factors for fragility osteoporotic fracture. Although fall history is more important risk factor in women (HR 1.30; P<0.001) than men (P=0.097), UI was not significant risk factors for fragility fracture in men (P=0.878) and women (P=0.324) (Table 3).

4. Mortality after osteoporotic fractures at (3, 6, 12, and 24) months follow-up

Mortality after fragility osteoporotic fracture in the UI group and comparison group were (0.2% vs. 0.6%) at 3 months (P=0.289), (0.8% vs. 1.4%) at 6 months (P=0.318), (2.1% vs. 1.9%) at 12 months (P=0.799), and (2.9% vs. 2.6%)

Table 2. Incidence rate of osteoporotic fracture by sex and urinary incontinence

Fracture type	Total			Men			Women		
	Men	Women	*P*-value	Urinary incontinence	Continence	*P*-value	Urinary incontinence	Continence	*P*-value
Total	4.3 (905/20,943)	12.0 (2,278/18,911)	<0.0001	4.8 (167/3,467)	4.2 (738/17,476)	0.116	13.9 (310/2,236)	11.8 (1,968/16,675)	0.005
Wrist	1.0 (199/20,943)	4.2 (798/18,911)	<0.0001	0.9 (31/3,467)	1.0 (168/17,476)	0.709	5.2 (116/2,236)	4.1 (682/16,675)	0.015
Proximal humerus	0.2 (47/20,943)	0.6 (106/18,911)	<0.0001	0.3 (9/3,467)	0.2 (38/17,476)	0.632	0.8 (17/2,236)	0.5 (89/16,675)	0.178
Vertebrae	2.9 (600/20,943)	7.6 (1,428/18,911)	<0.0001	3.2 (112/3,467)	2.8 (488/17,476)	0.158	8.0 (178/2,236)	7.5 (1,250/16,675)	0.435
Hip	0.4 (86/20,943)	0.5 (99/18,911)	0.098	0.6 (21/3,467)	0.4 (65/17,476)	0.049	0.8 (18/2,236)	0.5 (81/16,675)	0.050

Table 3. Risk factors of osteoporotic fracture in elderly populations

	Women		Men	
	HR (95 % CI)	*P*-value	HR (95 % CI)	*P*-value
Activities of daily living	1.19 (0.96-1.47)	0.105	1.04 (0.78-1.41)	0.781
Memory impairment	1.27 (1.14-1.41)	<0.001	1.39 (1.17-1.65)	<0.001
Difficult of walking	1.58 (1.24-2.02)	<0.001	1.75 (1.16-2.64)	0.008
Exercise	0.86 (0.76-0.93)	<0.001	1.01 (0.86-1.18)	0.933
Smoking	1.48 (1.11-2.01)	0.008	1.29 (1.11-1.49)	<0.001
Alcohol	1.05 (0.91-1.21)	0.483	0.94 (0.82-1.08)	0.412
Depression	1.10 (1.00-1.21)	0.069	1.26 (1.06-1.49)	0.007
Chronic disease				
Dementia	0.86 (0.73-1.01)	0.073	1.11 (0.84-1.47)	0.456
Cancer	0.82 (0.73-0.93)	0.003	0.82 (0.70-0.98)	0.025
Chronic kidney disease	0.86 (0.60-1.26)	0.445	0.82 (0.53-1.27)	0.379
Fall history	1.30	<0.001	1.25	0.097
Urinary incontinence	1.07	0.324	0.99	0.878

HR, hazard ratio; CI, confidence interval.

Table 4. Mortalities of fragility fractures in patients with or without urinary incontinence

Fracture type	3 months			6 months			1 year			2 years		
	UI (+)	UI (-)	*P*-value	UI (+)	UI (-)	*P*-value	UI (+)	UI (-)	*P*-value	UI (+)	UI (-)	*P*-value
Total	0.2% (1/477)	0.6% (17/2,706)	0.289	0.8% (4/477)	1.4% (38/2,706)	0.318	2.1% (10/477)	1.9% (52/2,706)	0.799	2.9% (14/477)	2.6% (71/2,706)	0.698
Wrist	0	0.2% (2/850)	0.556	0.7% (1/147)	0.4% (3/850)	0.562	0.7% (1/147)	0.6% (5/850)	0.894	0.7% (1/147)	0.8% (7/850)	0.857
Proximal humerus	0	1.6% (2/127)	0.520	3.8% (1/26)	2.4% (3/127)	0.666	3.8% (1/26)	2.4% (3/127)	0.666	3.8% (1/26)	3.9% (5/127)	0.983
Vertebrae	0.3% (1/290)	0.7% (13/1,738)	0.443	0.7% (2/290)	1.8% (31/1,738)	0.173	2.8% (8/290)	2.5% (43/1,738)	0.775	3.8% (11/290)	3.3% (57/1,738)	0.653
Hip	0	1.4% (2/146)	0.462	0	3.4% (5/146)	0.241	0	3.4% (5/146)	0.241	2.6% (1/39)	5.5% (8/146)	0.452

UI, urinary incontinence.

(*P*=0.698) at 24 months, respectively. There was no difference of mortality between the 2 groups during follow-up periods (Table 4).

DISCUSSION

This study was to assess the relationship between UI and fragility fractures in the elderly population using the nationwide health examination database. This study found that the fall experience in populations with UI was 4.4 times higher than those without UI, and the cumulative incidence of fragility fractures, including wrist, proximal humerus, vertebrae, and hip, was also significantly higher in women with UI (*P*=0.005). However, after adjustment, UI is not a significant risk factor for fragility fractures in men (*P*=0.878) and women (*P*=0.324), but fall history is more important risk factor in women (HR 1.30; *P*<0.001) than men (*P*=0.097).

In this study, patients with UI experienced a higher rate of fall and poor activity, ambulation and medical conditions. These findings consistently corresponded with previous studies. Some studies reported that patients with UI experienced higher risk of falls.[2-4,11] In addition, Palmer et al. [17] reported that confusion (odds ratio [OR], 3.44; 95% confidence interval [CI], 2.79-4.24), use of a wheelchair or device for walking (OR, 1.53; 95% CI, 1.29-1.83), and pre-fracture dependence on others for ambulation (OR, 2.51; 95% CI, 1.64-3.85) significantly increased the odds of developing incontinence. This study, after adjustment of confounding factors including sex, alcohol, dementia, cancer and CKD, memory impairment depression, activities of dai-

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Table 5. Studies of the risk of fall and/or fractures in patients with urinary incontinence

Study	Design	Cases	Minimum follow-up	Risk of falls	Risk of fractures
Schluter et al.[3]	Prospective cohort	67,289	2-year	1.39 (1.32-1.46) for women 1.69 (1.57-1.82) for men	NA
Brown et al.[2]	Prospective cohort	6,049	3-year	1.26 (1.14-1.40)	1.34 (1.06-1.69)
Wagner et al.[11]	Prospective cohort	5,204	NA	2.26 (1.46-3.51)	NA
Hasegawa et al.[4]	Prospective cohort	1,082	2-year	2.14 (1.63-2.79)	NA
This study	Prospective cohort	39,854	2-year	NA	NA

NA, not applicable.

ly living, and difficult of walking, were significantly associated with fragility fractures in the patients with UI.

Although UI is generally accepted as a risk factor for fall, [6,18,19] the relationship between fragility fracture and UI with fall is still controversial. Chiarelli et al.[1] performed a systemic review and meta-analysis using nine observational studies, and reported that the odds of falling were 1.45 (95% CI, 1.36-1.54) in the presence of any type of UI. In addition, Schluter et al.[3] performed a continuously recruited national cohort study using 67,289 (25,257 [37.5%] men and 42,032 [62.5%] women) at a minimum 2-year follow-up, and reported that UI is a common independent risk factor for falls (1.39 [1.32-1.46] for women and 1.69 [1.57-1.82] for men), but not hip fractures. So far, reported studies regarding the relationship between UI and fragility fracture are inconsistent (Table 5). Few studies have proven a relationship between fragility fracture and UI. Brown et al.[2] reported 6,049 community–dwelling women to assess the association of UI and risk of falling or fracture. They found that 55% of women reported falling, and 8.5% reported fractures during an average follow-up of 3 years. Johansson et al.[20] reported that hip fracture in the elderly women was significantly associated with UI ($P<0.001$) for women, and the odds of fracture were 2.42 (95% CI, 1.23-4.74). In this study, fall history in women is important risk factors in Table 3. Specially, after adjustment, fall history in women is a significant risk factor for fragility fractures (HR, 1.30; $P<0.001$). This might be related to the role of UI. A possible mechanism of fall in patients with UI is suggested that behavioral symptoms due to UI, including wandering and agitation, have been demonstrated to be associated with an increased risk of falls.[2,21,22] Hence, this study suggests that the identification and treatment of UI may be effective identification for the reduction of the risk of falls. Environmental modifications, such as a bedside commode for women with frequent nocturia, may also decrease falls and recurrent falls. Although this study assessed the relation between UI and osteoporotic fractures, there was not significant association. However, further study may have revealed the association UI and osteoporotic fractures.

In this study, the overall cumulative incidence of fragility fractures in women with UI (310/2,236, 13.9%) was significantly higher than in men (1,968/16,675, 11.8%). Among fragility fracture, distal radius and hip were significantly higher than other fractures. This might be related to the fall mechanism.

Even though we could not reveal a significant relationship between UI and fragility fracture, longer follow-up and larger sample sizes could possibly prove the effect of fragility fractures in patients with UI. In this study, after adjustments with other risk factors, women with UI who had experience of fall were significantly associated with fragility fracture.

There are several limitations to our study. First, definitions of the UI patients were not available, because the study was designed based on claims data and self-report. Self-report about UI could lead to selection bias, in that subjects with UI may have underreported their symptoms, but the survey questionnaire is a common method used in the collection of UI information. The Korean National Health Insurance Database provides representative data of the total Korean population, and minimizes the selection bias. Second, another limitation in this study is that the type of UI was not determined. The type of UI has been found to be an important predictor of the adverse outcome of falls and fragility fractures. Third, the status values such as lower exercise and heavy smoking could not be evaluated in this study, because it was difficult to assess and differentiate those values. Finally, this study was unable to distinguish recurrent falls that may have a risk, from patients who have fallen only once.

CONCLUSION

This study demonstrates that elderly women with UI are significantly associated with a high incidence of fragility osteoporotic fractures. In addition, fall in women is an important risk factor in the elderly population.

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