Acta Med. Nagasaki 52: 7－11

Fear of Falling among Community-dwelling Elderly Women Receiving Visiting Nursing Services in Japan

Kiyako TAKAI,[1] Sumihisa HONDA,[2] Zhaojia YE,[1] Yasuyo ABE,[1] Noboru TAKAMURA,[1] Makoto OSAKI,[1] Yosuke KUSANO,[3] Tai-ichiro TAKEMOTO,[4] Kiyoshi AOYAGI[1]

[1] Department of Public Health, Graduate School of Biomedical Sciences, Nagasaki University, Nagasaki, Japan

[2] Research Center for Tropical Infectious Diseases, Institute of Tropical Medicine, Nagasaki University, Nagasaki, Japan

[3] Human Service and Community Development, Nagasaki Wesleyan University, Isahaya, Nagasaki, Japan

[4] Department of Health and Nutrition, Faculty of Health Management, Nagasaki International University, Sasebo, Nagasaki, Japan

Although fear of falling is a common and serious problem among elderly people, little is known about the risk factors associated with fear of falling among frail elderly persons in Japan. To assess the fear of falling and investigate related factors, we conducted a study among 167 Japanese women aged 59 or older, who were receiving visiting nursing services. Fear of falling was measured by asking subjects about being afraid of falling (yes/no) and completing the Japanese version of Falls Efficacy Scale (FES). Fear of falling (being afraid of falling) was reported by 135 (80.8%) of the subjects. The overall FES score was significantly (p<0.01) lower in subjects who reported fear of falling (mean± standard deviation=19.8±5.5) than in those who did not (26.1±7.2). The Japanese version of FES effectively identified persons having a fear of falling. Multiple linear regression analysis showed that palsy, incontinence, and falls during the past year were significantly associated with an increase in fear of falling (measured by FES). The present study suggests that fear of falling is common among elderly women receiving visiting nursing services. Preventive strategies to reduce fear of falling and falls are needed, and would contribute to prevention of being bedridden and institutionalized for the frail elderly.

ACTA MEDICA NAGASAKIENSIA 52: 7－11, 2007

Keywords: Fear of falling; Risk factors; Elderly; Visiting nursing service; Falls Efficacy Scale

Introduction

Falling is a common problem associated with aging. Annually, 30% of people aged 65 years or over sustain a fall and the number rises to 40% for people aged 80 years or over.[1] Although serious injuries such as hip and wrist fractures are well-recognized consequences of falls, the fear of falling is thought to be a more pervasive problem in the elderly population.[2] Fear of falling is more prevalent with increasing age and fall history,[3,4] and has been reported in 12% to 65% of elderly people who live independently in the community even though they have never experienced a fall.[4-6] When compared with other common fears including finances, criminal violence, or experiencing a serious health problem, fear of falling ranked first among elderly people living in the community.[7,8] The impact of this fear often leads to avoidance of activities, social isolation and decreased quality of life.[7,9,10]

Tinetti et al.[11] developed the Falls Efficacy Scale (FES) to measure the fear of falling based on the operational definition of this fear as "low perceived self-efficacy at avoiding falls during essential, non-hazardous activities of daily living." Relative to merely determining the presence or absence of fear, the FES can avoid the psychiatric connotations associated with the word "fear" and can expand a relatively insensitive dichotomous measure to a continuous measure of the degree of confidence. The FES is reported to be usable with older adults who are homebound and have low mobility.[12]

In Japan, with the rapid aging of the population, visiting nursing services are introduced to prevent frail elderly from being bedridden and institutionalized. However, previous studies on fear of falling[3,7,13] relied on surveys of all community-based elderly persons. Little is known about the frail elderly, such as those who receive

Address correspondence: Kiyoshi Aoyagi, M.D., Ph.D., Department of Public Health, Nagasaki University Graduate School of Biomedical Sciences, 1-12-4 Sakamoto, Nagasaki 852-8523 JAPAN

TEL: +81-(0)95-849-7067, FAX: +81-(0)95-849-7069, E-mail: kiyoshi@nagasaki-u.ac.jp

Received January 11, 2007; Accepted January 30, 2007

visiting nursing services. The present study, therefore, aimed to assess the fear of falling, and to identify characteristics associated with fear of falling among elderly women receiving visiting nursing services.

Materials and Methods

A total of 195 elderly women receiving visiting nursing services in Nagasaki city, Japan, participated in the present study. The subjects to be included were those being: not bedridden, and able to respond to questions. After obtaining written informed consent, we interviewed the subjects in August 2003 with the cooperation of the visiting nurses. This study was approved by the Ethics Committee of Nagasaki University Graduate School of Biomedical Sciences.

Subjects were asked questions on chronic diseases or symptoms (hypertension, heart disease, chronic obstructive pulmonary disease, Parkinson's disease, arthritis, palsy, numbness of feet and vertigo), medication use, functional impairment (hearing, or visual impairment or incontinence), dependence in basic activities of daily living (ADL) (feeding, bathing, dressing, toileting and transferring) and fall history in the past year. We defined a fall as, "An event which results in a person coming to rest unintentionally on the ground or other lower level, not as the result of a major intrinsic event or overwhelming hazard."[14]

Fear of falling was measured by the question, "Are you afraid of falling?" with the answer of "yes" or "no" and the Japanese version of FES. Regarding FES, the question "How confident are you that you can do the activity without falling?" was used to assess the confidence in accomplishing 10 different activities (taking bath or shower, reaching into cabinets or closets, preparing simple meals, walking around the house, getting in and out of bed, getting in and out of a chair, answering the door or telephone, getting dressed, performing light housekeeping, and doing simple shopping) on a four-category scale from 1 (no confidence) to 4 (complete confidence). Overall FES scores ranged from 10 to 40, and higher scores indicated higher confidence or efficacy. In this study, we use "fear of falling" as a general term to describe both being afraid of falling and scoring low on the FES.

We excluded, from the analysis, those with incomplete responses to the questions, and 167 (85.6%) subjects remained. The association between being afraid of falling and FES score was examined by Wilcoxon rank-sum test. The simultaneous effects of variables on FES score were analyzed by multiple linear regression models. Starting with a full model including all variables, the most appropriate model was selected on the basis of Akaike's information criteria (AIC). NPAR1WAY and REG in the SAS® system, version 8.2 (SAS Institute Inc., Cary, NC, USA) were used for the calculations.

Results

The subjects ranged in age from 59 to 98 years with the mean (standard deviation or SD) of 81.6 (8.0) years; the number of subjects in ages of 59-69, 70-79, 80-89 and 90 years or over was 13, 49, 75 and 30, respectively. Table 1 summarizes the characteristics of subjects. The prevalence, for hypertension, heart disease, arthritis and incontinence was over 50% among the subjects. Approximately, three fourths of the subjects could not bathe or transfer independently. Ninety-seven (58.1%) subjects reported at least one fall in the past year. A total of 135 (80.8%) had a fear of falling.

The FES score ranged from 10 to 39 for all subjects with the mean (SD) of 21.0 (6.3). Subjects who reported being afraid of falling showed significantly ($p<0.01$) lower FES scores (mean±SD=19.8±5.5) than those who did not (26.1±7.2) (Figure 1). The score of individual items of FES was also significantly lower ($p=0.03$ or $p<0.01$) in subjects who reported being afraid of falling than in those who did not (Table 2). In general, subjects reported high confidence (higher score) in getting in and out of the bed and getting dressed, and low confidence in doing simple shopping.

Table 3 compares the distribution of FES score by chronic diseases or symptoms, medication use, functional impairment and fall history. The factors showing a significant association with FES score were Parkinson's disease ($p=0.05$), palsy ($p=0.01$), incontinence ($p<0.01$) and falls during the previous year ($p<0.01$).

Table 1. Characteristics of 167 subjects studied

Factor	Number of subjects	Frequency (%)
Disease or symptom		
Hypertension	106	63.5
Heart disease	84	50.3
Chronic obstructive pulmonary disease	18	10.3
Parkinson's disease	16	9.5
Arthritis	93	55.7
Palsy	41	24.8
Numbness of feet	75	44.9
Vertigo	68	40.7
Medication		
Antihypertensive	98	58.7
Sedative	80	47.3
Physical function		
Hearing impairment	56	33.5
Visual impairment	50	29.9
Incontinence	85	50.9
Activity of daily living requiring help		
Feeding	45	26.9
Bathing	128	76.6
Dressing	43	25.7
Toileting	48	28.7
Transferring	123	73.7
Fall		
Fall during the previous year	97	58.1
Being afraid of falling	135	80.8

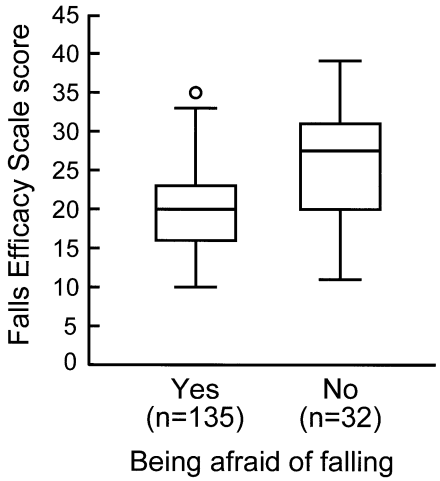

Figure 1. The box-and-whisker plots for the overall score of Falls Efficacy Scale by fear of falling (being afraid of falling). The bottom and top ends of the box and the bar inside the box correspond to the 25th, 75th and 50th percentile, respectively. The open circle represents an extreme value called "outside."

Table 2. Distribution of scores for individual items of "Falls Efficacy Scale" in 167 women assessed for fear of falling (being afraid of falling)

Items	Fear of falling (being afraid of falling)		*p*-value[a]
	Yes	No	
Taking bath or shower	1.8 (0.8)[b]	2.5 (0.7)	<0.01
Reaching into cabinets or closets	2.3 (1.0)	3.1 (1.0)	<0.01
Preparing simple meals	1.7 (0.9)	2.4 (1.2)	<0.01
Walking around the house	1.7 (0.7)	2.4 (1.0)	<0.01
Getting in and out of bed	2.7 (0.8)	3.4 (0.7)	<0.01
Getting in and out of a chair	2.1 (0.9)	2.7 (1.0)	<0.01
Answering the door or telephone	2.1 (0.7)	2.8 (1.0)	<0.01
Getting dressed	2.6 (0.9)	3.2 (1.1)	<0.01
Performing light housekeeping	1.6 (0.7)	2.0 (1.0)	0.03
Doing simple shopping	1.3 (0.6)	1.8 (1.1)	<0.01

[a]Wilcoxon rank-sum test.
[b]Mean (standard deviation).

Table 3. Distribution of overall score of "Falls Efficacy Scale" in 167 women assessed for respective factors: disease, symptom, medication, physical function and fall

Disease					
	Hypertension	Heart disease	Chronic obstructive pulmonary disease	Parkinson's disease	Arthritis
Yes	21.2 (6.2)[a]	21.7 (6.4)	21.9 (7.1)	18.0 (3.0)	21.7 (5.6)
No	22.2 (6.3)	21.5 (6.1)	21.6 (6.2)	22.0 (6.4)	21.4 (7.2)
p-value[b]	0.16	0.71	0.83	0.05	0.62

Symptom			
	Palsy	Numbness of feet	Vertigo
Yes	19.8 (5.2)	22.6 (6.7)	21.7 (6.0)
No	22.1 (6.4)	20.9 (5.8)	21.5 (6.5)
p-value	0.01	0.27	0.45

Medication		
	Antihypertensive	Sedative
Yes	21.5 (6.2)	21.4 (6.4)
No	21.8 (6.4)	21.8 (6.2)
p-value	0.64	0.11

Physical function			
	Hearing impairment	Visual impairment	Incontinence
Yes	20.8 (6.9)	20.9 (6.4)	19.5 (5.6)
No	21.2 (6.1)	21.2 (6.4)	22.7 (6.7)
p-value	0.65	0.92	<0.01

Fall	
	Falls during the previous year
Yes	19.7 (6.0)
No	22.9 (6.4)
p-value	<0.01

[a]Mean (standard deviation).
[b]Wilcoxon rank-sum test.

In order to determine the factors influencing FES score, multiple linear regression analysis was conducted with factors listed in Table 3; we dichotomized all factors by assigning 1 and 0 to "yes" and "no," respectively. The factors included in the model selected as most appropriate were Parkinson's disease, palsy, use of sedatives, incontinence and falls during the previous year (Table 4). Palsy, incontinence and falls during the past year were significantly associated with an increase in fear of falling. The findings presented in Table 4 indicate, for example, that in two persons who were the same with respect to factors listed in the table except palsy, the FES score was approximately 2.45 points lower for the one with palsy compared to the one without palsy.

Table 4. Results of multiple linear regression analysis for the overall score of "Falls Efficacy Scale" in 167 women

Factor	Regression coefficient (standard error)	*p*-value
Parkinson's disease	-2.06 (1.59)	0.20
Palsy	-2.45 (1.08)	0.03
Use of sedative	-1.43 (0.93)	0.13
Incontinence	-2.40 (0.98)	0.02
Falls during the previous year	-2.18 (0.99)	0.03

Discussion

The present study provides information on fear of falling in elderly women receiving visiting nursing services, an important group for fall prevention, and examined the risk factors for fear of falling using the FES. Palsy, incontinence and falls during the past year were associated with an increased fear of falling. This information may contribute to reduction of deterioration in health and institutionalization.

We found that 81% of the subjects had fear of falling (being afraid of falling). Fear of falling has been reported in approximately 10%-55% of community-dwelling people aged 65 years or over.[3,15,16] Our results may reflect that fear of falling is a particularly serious problem for elderly people necessitating visiting nursing services. Many of our subjects had multiple chronic diseases or symptoms, and showed a tendency of high dependence on caregivers in daily activities. These characteristics of the subjects may have resulted in higher prevalence of fear of falling in this study. Several studies show that most frail elderly have fall experience and fear of falling.[3,13,17]

In our study, the overall score and scores of respective items of FES were significantly (p=0.03 or p<0.01) lower in subjects who reported fear of falling (being afraid of falling) than in those who did not. This finding indicates that the Japanese version of FES effectively distinguishes between those with and those without fear of falling. In contrast to simply inquiring about the presence or absence of fear of falling, this Japanese version of FES scoring system would be a useful measure for assessing this fear.

Postural instability[18] and motor disability[19] increase the fear of falling. In our study, palsy was significantly associated with fear of falling (measured by FES). Several studies also reported that Parkinson's disease was related to fear of falling.[18,19] In our study, however, association between Parkinson's disease and fear of falling was not statistically significant in multivariate analysis, although there was marginal significance (p=0.05) in the univariate analysis. Parkinson's disease and incontinence were marginally associated (p=0.07, Fisher's exact test), and this may in part explain the above-mentioned discrepancy. Furthermore, other diseases or symptoms such as rheumatoid arthritis[20] and vertigo[21] reported to be associated with fear of falling also did not show a significant association with fear of falling. However, those diseases or symptoms might be associated with fear of falling if their severity had been taken into account; unfortunately we could not obtain such information.

In the present study, a significant association was observed between urinary incontinence and fear of falling. Several studies[22,23] reported the relationship between urinary incontinence and falling; however, to our knowledge, no reports address the relationship between urinary incontinence and fear of falling. Since urinary incontinence impairs daily activities, it may cause fear of falling through the loss of confidence in performing the activities. Further study is needed to investigate the relationship of urinary incontinence to fear of falling in frail elderly individuals.

Multivariate analysis showed a significant (p=0.03) association between falls during the previous year and fear of falling (FES). Previous studies reported that experience of falls in the past was related to fear of falling.[5,24] Arfken et al.[3] and Lach[25] indicated the association between the number of falls experienced and fear of falling. Furthermore, the degree of injury after falls might affect the fear of falling; if the fall results in serious injury, the fear of falling will be increased. A recent study suggested that falls and fear of falling were mutually predictive.[9] Thus, once an individual experiences a fall, interventions to reduce fear of falling are important.

Our study has several limitations. First, the study design was cross-sectional. Longitudinal study is needed for the inference of causal relationships among these factors and better insight into the psychological aspects of the fear of falling. Second, the study included only women, and application of the results to men is limited. Third, some factors such as mental status, economic resources and social contacts associated with fear of falling were not available in our study. Further studies are needed for clarifying the association of these factors with fear of falling.

In conclusion, the Japanese version of FES appears to be a useful tool for measuring fear of falling, and fear of falling is common among women who are receiving visiting nursing services. The present study suggests that adequate treatment of the contributing diseases or symptoms and prevention of falls are important for decreasing fear of falling. Strategies to reduce fear of falling would prevent elderly individuals receiving visiting nursing services from becoming bedridden or institutionalized.

References

1. Prudham D, Evans JG. Factors associated with falls in the elderly: a community study. *Age Ageing* 10: 141-146, 1981
2. Hatch J, Gill-Body KM, Portney LG. Determinants of balance confidence in community-dwelling elderly people. *Phys Ther* 83: 1072-1079, 2003
3. Arfken CL, Lach HW, Birge SJ et al. The prevalence and correlates of fear of falling in elderly persons living in the community. *Am J Public Health* 84: 565-570, 1994
4. Howland J, Lachman ME, Peterson EW et al. Covariates of fear of falling and associated activity curtailment. *Gerontologist* 38: 549-555, 1998
5. Lachman ME, Howland J, Tennstedt S et al. Fear of falling and activity restriction: the survey of activities and fear of falling in the elderly (SAFE). *J Gerontol B Psychol Sci Soc Sci* 53: 43-50, 1998
6. Tinetti ME, Mendes de Leon CF, Doucette JT et al. Fear of falling and fall-related efficacy in relationship to functioning among community-living elders. *J Gerontol* 49: 140-147, 1994
7. Howland J, Peterson EW, Levin WC et al. Fear of falling among the community-dwelling elderly. *J Aging Health* 5: 229-243, 1993
8. Lawrence RH, Tennstedt SL, Kasten LE et al. Intensity and correlates of fear of falling and hurting oneself in the next year: baseline findings from a Roybal Center fear of falling intervention. *J Aging Health* 10: 267-286, 1998
9. Friedman SM, Munoz B, West SK et al. Falls and fear of falling: which comes first? A longitudinal prediction model suggests strategies for primary and secondary prevention. *J Am Geriatr Soc* 50: 1329-1335, 2002
10. Delbaere K, Crombez G, Vanderstraeten G et al. Fear-related avoidance of activities, falls and physical frailty. A prospective community-based cohort study. *Age Ageing* 33: 368-373, 2004
11. Tinetti ME, Richman D, Powell L. Falls efficacy as a measure of fear of falling. *J Gerontol* 45: 239-243, 1990
12. Legters K. Fear of falling. *Phys Ther* 82: 264-272, 2002
13. Kressig RW, Wolf SL, Sattin RW et al. Associations of demographic, functional, and behavioral characteristics with activity-related fear of falling among older adults transitioning to frailty. *J Am Geriatr Soc* 49: 1456-1462, 2001
14. Clark RD, Lord SR, Webster IW. Clinical parameters associated with falls in an elderly population. *Gerontology* 39: 117-123, 1993
15. Velozo CA, Peterson EW. Developing meaningful Fear of Falling Measures for community dwelling elderly. *Am J Phys Med Rehabil* 80: 662-673, 2001
16. Evitt CP, Quigley PA. Fear of falling in older adults: a guide to its prevalence, risk factors, and consequences. *Rehabil Nurs* 29: 207-210, 2004
17. Tinetti ME, Powell L. Fear of falling and low self-efficacy: a case of dependence in elderly persons. *J Gerontol* 48 *Spec No*: 35-38, 1993
18. Adkin AL, Frank JS, Jog MS. Fear of falling and postural control in Parkinson's disease. *Mov Disord* 18: 496-502, 2003
19. Franchignoni F, Martignoni E, Ferriero G et al. Balance and fear of falling in Parkinson's disease. *Parkinsonism Relat Disord* 11: 427-433, 2005
20. Jamison M, Neuberger GB, Miller PA. Correlates of falls and fear of falling among adults with rheumatoid arthritis. *Arthritis Rheum* 49: 673-680, 2003
21. Salles N, Kressig RW, Michel JP. Management of chronic dizziness in elderly people. *Z Gerontol Geriatr* 36: 10-15, 2003
22. Brown JS, Vittinghoff E, Wyman JF et al. Urinary incontinence: does it increase risk for falls and fractures? Study of Osteoporotic Fractures Research Group. *J Am Geriatr Soc* 48: 721-725, 2000
23. Tinetti ME, Speechley M, Ginter SF. Risk factors for falls among elderly persons living in the community. *N Engl J Med* 319: 1701-1707, 1988
24. Cumming RG, Salkeld G, Thomas M et al. Prospective study of the impact of fear of falling on activities of daily living, SF-36 scores, and nursing home admission. *J Gerontol A Biol Sci Med Sci* 55: 299-305, 2000
25. Lach HW. Incidence and risk factors for developing fear of falling in older adults. *Public Health Nurs* 22: 45-52, 2005