

Falls of the elderly are associated with burden of caregivers in the community[†]

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SUMMARY

Background Little attention has been paid to the impact on caregivers who provide care to a family member who has falls. The purpose of the current study was to determine whether falls of care recipients are associated with caregivers' burden.

Methods A cross-sectional study of 1874 community-dwelling care recipients and 1478 caregivers was conducted. We examined the characteristics of care recipients and caregivers, including demographic characteristics, depressive mood as assessed by the Geriatric Depression Scale (GDS-15), the basic activities of daily living (bADL), fall history in the past 6 months, and physician-diagnosed chronic diseases to determine whether there was an association with caregivers' burden as assessed by the Zarit Burden Interview (ZBI).

Results A total of 567 care recipients (30.3%) had a history of falls in the past 6 months. The mean ZBI score of caregivers with falls was significantly higher than that of caregivers without falls. There were negative correlations between the ZBI score and recipient bADL score and positive correlations between the ZBI score and GDS-15 scores of the recipient and caregiver, the level of severity of dementia, and the Charlson comorbidity index. Male recipient, fall history, behavioral disturbance, and dementia had significantly higher ZBI scores than those of controls. The stepwise multiple regression analyses found that the GDS-15 score of caregivers and recipients, level of severity of dementia, bADL score, and fall history were independently associated with the ZBI score.

Conclusion Among the community-dwelling frail elderly, falls are associated with caregiver burden even when controlling for various possible confounding factors. Copyright © 2006 John Wiley & Sons, Ltd.

KEY WORDS—falls; caregiver burden; depression; elderly

Family caregivers of frail elderly experience high levels of burden. Numerous studies have found that care-giving is extremely stressful and results in adverse physiological and psychological outcomes for both caregivers and recipients (Schulz and Beach, 1999; Vedhara *et al.*, 1999; Yaffe *et al.*, 2002). It has been demonstrated that various factors including functional or cognitive impairment with behavioral

disturbance of care recipients are associated with the caregiver's burden (Pinquart and Sorensen, 2003).

Falls are a significant problem among elderly living not only in the community but also in institutions (Tinetti *et al.*, 1998; Tromp *et al.*, 1998). Falls constitute the largest single cause of injury mortality in elderly individuals (Sattin *et al.*, 1990) and are an independent determinant of functional decline (Tinetti and Williams, 1998), leading to nursing home admissions (Tinetti *et al.*, 1997) and substantial societal costs (Rizzo *et al.*, 1998). In addition, several studies have determined that the consequences of falls include not only physical injury and decline in functional status but also fear of falling, which may lead to restriction in activity or increased dependency (Cumming *et al.*, 2000; Kressig *et al.*, 2001). Thus, falls in frail elderly have been intensively studied in the past decade, but little attention has been paid to the

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impact that providing care to a family member with a fall history has on caregivers. The purpose of this study was to address the following question: are falls of recipients associated with burden of caregivers?

METHODS

Study design and subjects

The present study consisted of a cross-sectional analysis of the baseline data of the participants in the Nagoya Longitudinal Study of the Frail Elderly (NLS-FE). The study population consisted of 1875 community-dwelling frail elderly (men: 632, women: 1243, age 65 years or older) who were eligible for long-term care insurance (LTCI), lived in Nagoya City, and were provided various home care services from the Nagoya City Health Care Service Foundation for Older People, which has 17 visiting nursing stations associated with care-managing centers. Japan introduced a universal-coverage LTCI program in April 2000. The LTCI system covers care for both the elderly aged 65 and older, and for persons aged 40 and older with 15 specific diseases such as cerebrovascular disease and presenile dementia. Under the LTCI program, care levels (level 0–level 5) are determined according to eligibility criteria. The elderly in the community who are eligible for LTCI are frail and chronically ill, have physical and mental problems, and are prone to being admitted to an acute hospital or institutional care setting.

During the registration period (1 November 2003 to 31 December 2003), 1875 of 3630 elderly clients agreed to participate in this study. NLS-FE participants were scheduled to undergo comprehensive in-home assessments by trained nurses at the baseline, 6, 12, and 24 months. In the present study, the cross-sectional data of 1874 among 1875 participants at the baseline were used. One participant was excluded because of a lack of information on the falls experienced. Among 1874 elderly, 1569 participants had caregivers. Ninety-one caregivers were excluded from the analysis because of the lack of their demographic characteristics. Therefore, a total of 1478 caregivers was used for the present study. Informed consent for participation, according to procedures approved by the institutional review board of Nagoya University Graduate School of Medicine, was obtained verbally from the patients or, for those with substantial cognitive impairment, from a surrogate (usually the closest relative or legal guardian), and from caregivers. The research protocol was

approved by the institutional review board of the Nagoya University.

Data collection

A total of 328 nurses visited clients' homes and collected data from structured interviews with patients or surrogates, caregivers, and care-managing center records according to the standard instruments. The data included clients' demographic characteristics, depressive symptoms as assessed by the short version of the Geriatric Depression Scale (GDS-15) (Yesavage, 1988), a rating for seven basic activities of daily living (bADL) (feeding, bathing, grooming, dressing, using the toilet, walking, and transferring) using summary scores ranging from 0 (total disability) to 20 (no disability) (Mahoney and Barthel, 1965), and a rating for the instrumental ADL (IADL) scale, which includes five tasks (shopping, housework, meal preparation, taking medications, and managing finances) using summary scores ranging from 0 (total disability) to 8 (no disability) (Lawton and Brody, 1969). The severities of dementia were evaluated according to the criteria provided by the public LTCI policy (Onishi *et al.*, 2005), which are classified into six levels (Level 0–Level 5). The participants were also asked whether they had fallen at least once in the previous 6 months.

Information obtained from care-managing center records included the physician-diagnosed chronic conditions and diseases comprising the Charlson comorbidity index (Charlson *et al.*, 1987), which represents the sum of a weighted index that takes into account the number and seriousness of pre-existing comorbid conditions.

Data were also obtained from caregivers concerning their own personal demographic characteristics, depressive symptoms as assessed by the GDS-15, and their subjective burden as assessed by the Japanese version of the Zarit Burden Interview (ZBI) (Arai *et al.*, 1997), which is a 22-item self-report inventory that examines the burden associated with functional behavioral impairments in the home care situation. The physical health status of the caregiver was assessed by visiting nurses at the home and classified into three categories: good, fair, and bad.

Statistic analysis

Student's *t*-test, the Mann–Whitney test, and the chi-squared test were used to compare differences between participants who had fallen during the

previous 6 months (fallers) and those who had not fallen (nonfallers). Pearson's linear correlation coefficient (or Spearman's variable, if any) was ordinal and/or not normally distributed for the correlation between the ZBI score and other variables. Partial rank correlation coefficients adjusted for age and gender were also used to measure the relationships between the ZBI score and variables. Student's *t*-test, or an analysis of variance with a Bonferroni correction for multiple comparisons, was used to determine the difference of ZBI scores among groups. To determine which variables were associated with the ZBI scale score, we performed a step-wise multiple linear regression analysis with a forward selection strategy, using an *F* value with a *p* < 0.05 as the selection criterion. All analyses were performed using the Statistical Package for the Social Sciences (SPSS)

Ver-11.0. A probability value of 0.05 or less was considered significant.

RESULTS

The differences of characteristics of care recipients and their caregivers between fallers and nonfallers are presented in Table 1. A total of 567 elderly (30.3%) had a fall history during the previous 6 months. No gender or age differences were detected between fallers and nonfallers. Although a higher mean score of GDS-15 was detected in fallers as compared with nonfallers, no statistically significant differences were observed between the two groups with respect to the status of bADL, IADL, or Charlson comorbidity index. The prevalence of congestive heart failure or dementia was higher in fallers than nonfallers.

Table 1. Characteristics of care recipients and caregivers

	Faller	Nonfaller	<i>p</i>
Care recipient variables			
Total number	567	1307	
Men/women (% of men/total)	196/371 (34.6)	436/871 (33.4)	0.611
Age (years), mean (SD) [*]	80.4 (7.6)	81.0 (7.8)	0.093
Basic ADL (range, 0–20), mean (SD) [†]	13.1 (5.5)	12.6 (7.0)	0.313
Instrument ADL (range, 0–8), mean (SD) [†]	3.2 (2.5)	3.3 (2.7)	0.832
GDS-15(range, 0–15), mean (SD) [†]	7.0 (3.5)	6.4 (3.7)	0.003
Charlson comorbidity index, mean (SD) [†]	2.0 (1.6)	1.9 (1.6)	0.153
Level of Severity of dementia (0–5) [†]	1.2 (1.1)	1.1 (1.3)	0.070
Polypharmacy (% of total)	40.9%	36.8%	0.002
Psychotropic medications (% of total)	33.6%	29.1%	0.064
Chronic diseases (% of total)			
Cerebrovascular disease	35.2%	34.0%	0.611
Hypertension	25.2%	23.8%	0.508
Diabetes mellitus	11.7%	12.1%	0.811
Congestive heart failure	10.6%	7.6%	0.039
Coronary heart disease	12.3%	12.1%	0.924
Dementia	39.9%	33.3%	0.009
Living arrangements			
living alone (%)	22.7%	22.2%	0.810
number of person living with, mean (SD) [†]	1.7 (1.5)	1.7 (1.6)	0.584
Caregiver variables			
Total number	451	1027	
Men/women (% of men/total)	112/370 (24.8)	277/809 (27.0)	0.337
Age (years), mean (SD) [*]	64.1 (12.6)	64.0 (12.5)	0.928
Relationship to care recipient			
Child	38.5%	34.5%	
Spouse	38.5%	41.3%	0.477
Daughter-in-low	18.9%	20.3%	
Others	4.2%	4.0%	
GDS-15(range, 0–15), mean (SD) [†]	5.8 (3.9)	5.4 (3.8)	0.175
ZBI score (range, 0–88), mean (SD) [†]	31.7 (17.6)	27.6 (16.7)	<0.001

*student *t*-test,

[†]Mann–Whitney test, Chi-squared test was used for others.

GDS-15: short version of geriatric depression scale, ZBI: Zarit Burden Interview.

Table 2. The correlation between ZBI score and other variables

	Crude		Adjusted*	
	r	p	r	p
Care recipient				
Age	-0.058	0.041	-0.051 [†]	0.079
Basic ADL score	-0.207	<0.001	-0.249	<0.001
Instrumental ADL score	-0.293	<0.001	-0.303	<0.001
GDS-15 score	0.262	<0.001	0.261	<0.001
Level of severity of dementia	0.282	<0.001	0.274	<0.001
Charlson comorbidity index	0.130	<0.001	0.106	<0.003
Caregiver				
Age	0.047	0.104	0.033 [‡]	0.260
GDS-15 score	0.535	<0.001	0.486	<0.001

*adjusted for age and gender of care recipient, and age and gender of caregiver.

[†]adjusted for gender of care recipient, and age and gender of caregiver.

[‡]adjusted for age and gender of care recipient, and gender of caregiver.

Although the rate of living alone, gender and age of caregivers, relationship of caregivers to care recipients, and GDS-15 scores of caregivers were not different between fallers and nonfallers, the mean ZBI score of caregivers was significantly higher for fallers than for nonfallers.

The correlations between the ZBI score and each of the variables for care recipients and caregivers are presented in Table 2. Although there was a negative correlation between care recipient age and ZBI score, no correlation was observed after adjusting for recipient gender and age and gender of caregiver. No significant correlation was detected between the caregiver's age and ZBI score. There were negative correlations between the care recipient's bADL, IADL, and ZBI scores. Positive correlations were found between GDS-15 scores of both care recipient and caregiver, care recipient level of severity of dementia, or Charlson comorbidity index and ZBI score. These correlations persisted after adjusting for age and gender of care recipient and caregiver.

The comparison of ZBI scores between genders and various groups with statistical difference are presented in Table 3. The following care recipient variables were significantly higher in ZBI scores in comparison with controls: male gender, fall history in the past 6 months, behavioral disturbance, diagnosis of dementia, or chronic obstructive pulmonary disease (COPD). When considering caregiver's variables, the ZBI score of the spouse of caregivers was higher than the ZBI score of the child caregiver, and the caregivers with a poorer status of physical health had a lower ZBI score.

Table 3. ZBI score comparison among various groups

	ZBI score			
	n	mean	SD	p
Care recipient				
Gender				
Men	452	31.2	17.2	<0.001
Women	805	27.6	16.8	
Age				
65–74 years-old	267	30.9	17.8	0.029
75 years old or older	990	28.4	16.8	
Fall history				
Absence	869	27.6	16.7	<0.001
Presence	388	31.7	17.6	
Behavioral disturbance				
Absence	999	26.3	15.8	<0.001
Presence	256	38.8	18.0	
Chronic diseases				
Dementia				
Absence	650	25.1	16.6	<0.001
Presence	471	33.3	16.5	
COPD				
Absence	1090	28.2	16.8	0.004
Presence	65	34.4	19.0	
Caregiver				
Gender				
Men	300	28.5	17.4	0.628
Women	955	29.1	16.9	
Age				
Younger than 65 years old	567	27.2	16.6	<0.001**
65–74 years old	310	33.1	17.5	
75 years-old or older	301	27.3	16.7	
Relationships of caregiver*				
Child	429	27.2	17.0	0.012 [†]
Spouse	529	30.7	17.9	
Daughter in law	261	28.2	15.2	
Others	35	29.1	15.9	
Physical health status*				
Good	495	24.6	15.9	<0.001 [‡]
Fair	606	31.2	16.4	
Bad	155	33.8	20.0	

*Analysis of Variance, student-t test was used for others.

**younger than 65 year vs 65–74 year: p < 0.001, 65–74 year vs 75 year or older, p < 0.001.

[†]child vs spouse: p = 0.008, others were not significant.

[‡]good vs fair: p < 0.001, good vs bad: p < 0.001, fair vs bad: p = 0.233.

COPD: chronic obstructive pulmonary disease.

The ZBI score of caregivers in the age group of 65–74 years was higher than that in other age groups.

The results of the stepwise multiple regression analyses to identify variables as predictors of subjective burden in caregivers of the frail elderly in the community are presented in Table 4. The care recipient's age and gender, fall history in the past 6 months, GDS-15 and bADL scores, Carlson comorbidity index, level of severity of dementia, and the

Table 4. Step-wise multiple linear regression of care recipients' and caregivers' variables on ZBI score

	B	SE	β	p
Caregiver GDS-15	1.899	0.143	0.420	<0.001
Level of severity of dementia	3.151	0.482	0.201	<0.001
Basic ADL score	-0.374	0.091	-0.128	<0.001
Fall experience	3.511	1.069	0.098	0.001
Recipient GDS-15	0.462	0.151	0.097	0.002

$R^2 = 0.334$, adjusted $R^2 = 0.329$.

The following variables were added to the analysis: care recipient's age and gender, fall history in the past 6 months, GDS-15 and bADL scores, Carlson comorbidity index, level of severity of dementia, the presence of COPD, age and gender of caregiver, caregiver's GDS-15 score, type of caregiver-care receiver relationship (spouse or child), and the physical health status of caregiver.

presence of COPD, as well as the age and gender of the caregiver, caregiver's GDS-15 score, type of caregiver-care receiver relationship (spouse or child), and the physical health status of the caregiver were entered into the regression analyses. The best set of predictors of burden, identified by stepwise linear regression, was the caregiver's GDS-15 score, level of severity of dementia, bADL score, fall history in the past 6 months, and care recipient's GDS-15 score. These variables accounted for 33% of the total variance in burden. When the presence of dementia and behavioral disturbance, rather than the level of severity of dementia, were entered into the analysis, the predictors of caregiver's GDS-15 score, presence of behavioral disturbance, bADL score of the care recipient, presence of dementia, fall history, and GDS-15 score of the care recipient were identified (adjusted $R^2 = 0.33$).

DISCUSSION

The present study demonstrated that previous fall history is associated with caregivers' burden. This association persists even when controlling for various possible confounding factors such as ADL status and the presence of chronic diseases including dementia. Although the exact reasons for this association are unknown, it is possible that the majority of caregivers are frightened about their family member falling, and that fall history leads to the psychological distress in the caregiver, which may be related to the caregiver's burden.

Consistent with previous reports (Colerick and George, 1986; Vedhara *et al.*, 1999; Yaffe *et al.*, 2002; Pinquart and Sorensen, 2003), the presence of dementia and behavioral disturbance, physical impairment, and caregiver depressive mood are independent predictors of caregiver burden in the present study. Numerous studies have demonstrated the burden of

caregivers of chronic psychiatrically ill elderly, and most are caregivers of demented elderly. It has been reported that depressive symptoms in elderly persons are independently associated with significantly higher levels of informal care-giving, even after adjustment for the effects of major coexisting chronic conditions (Langa *et al.*, 2004). Patient depression was also associated with poor caregiver quality of life (Sewitch *et al.*, 2004). However, few studies had been conducted to examine the association between caregiver burden and recipient depressive mood. One study using a small sample size from outpatient mental clinics reported that patients' behavior and mood disturbance are associated with caregiver burden (Scauzufca *et al.*, 2002). In the present study it was clearly demonstrated that care recipient depressive mood is associated with caregiver burden. Although depression is known to be frequently associated with cognitive and physical impairment, this association persists even when adjusting for these factors. Although in this study the level of care-giving was not estimated, it appears that higher levels of care-giving to the depressed elderly reflect the caregiver's burden. It has been reported that depressive mood might be one of the risk factors of falls (Cesari *et al.*, 2002), although we still do not know if depression is a consequence of falls or if depression triggers the fall. Therefore, it is possible that the care recipient depressive mood associated with falls may affect caregiver burden.

Several potential limitations of this study are noted. First, the participants, although a community-based sample, were frail elderly eligible for the LTCI program and, therefore, it may not be possible to generalize the results to healthy elderly. Second, other factors that have been demonstrated to be related to the caregiver's burden, including incontinence of the care recipient (Flaherty *et al.*, 1992) and durations of care-giving (McConaghay and Caltabiano, 2005), were not incorporated into this analysis. Therefore, the possibility exists that a variable omitted from the analysis may contribute to the burden of the caregiver. Economic status and perceived social support may also be related to caregiver burden (Murray *et al.*, 1999). However, the economic status, which was classified into three subjective categories, as well as the number of formal services used, did not correlate with caregiver burden in this study's population (data not shown). Third, the number of falls in the past 6 months was not available in the baseline data of the participants of the NLS-FE. Therefore, the effect of the fall frequency on caregiver burden has not been evaluated.

KEY POINTS

- Little attention has been paid to the impact on caregivers who provide care to a family member who has falls.
- We demonstrated that the fall history in the past 6 months of the frail elderly living in the community, as well as care recipient depressive mood, was associated with caregiver burden.
- Preventing falls is important, not only for the frail elderly but also for their caregivers, to reduce care burden.

In the present study it was demonstrated that fall history in the past 6 months, as well as care recipient depressive mood, is associated with caregiver burden. It appears that preventing falls is important, not only for the frail elderly but also for their caregivers, to reduce care burden. In addition, health care professionals should inquire about the adequacy of social support for their elderly patients with depressive symptoms and should also be alert to potential caregiver burden among the family members who provide care.

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