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Effects of mild and global cognitive impairment on the prevalence of fear of falling in community-dwelling older adults

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ABSTRACT

Objectives: Few studies have reported the relationship between fear of falling (FoF) and mild and global cognitive impairment in community-dwelling older adults. We aimed to determine whether the status of cognitive impairment affects the prevalence of FoF in community-dwelling older adults.
Study design: Cross-sectional study among 4474 community-dwelling older adults who participated in the Obu Study of Health Promotion for the Elderly.
Main outcome measures: Participants underwent cognitive tests and were divided into three groups: cognitive healthy, mild cognitive impairment (MCI), and global cognitive impairment (GCI). FoF and related variables, such as fall history, physical function, and depression, were also investigated.
Results: The prevalence of FoF was significantly different by group ($p < 0.001$; healthy: 43.6%, MCI: 50.6%, GCI: 40.6%). Logistic regression analysis showed that GCI (odds ratio = 0.63; 95% confidence interval = 0.526–0.76) was independently associated with FoF, after controlling for confounding factors. Older adults with GCI showed the lowest prevalence of FoF, although they had the lowest physical function comparing with the other groups ($p < 0.001$).
Conclusion: MCI and GCI in community-dwelling older adults affect the prevalence of FoF in a completely different manner. Further study is required to determine whether insensitivity to FoF with GCI increases the risk of falling in older adults.

1. Introduction

Fear of falling (FoF) is defined as "a lasting concern about falling that leads to an individual avoiding activities that he/she remains capable of performing" [1]. The main consequences of FoF are an increased risk for falling, restriction and avoidance of activities, and ultimately, deteriorated physical and mental performance, as well as decreased quality of life [2]. The prevalence of FoF ranges from 33% to 85%, being higher in women than in men, and increases with age [3,4]. FoF is associated with a history of falls, gait speed, use of walking aids, polypharmacy, and depression [5,6]. In spite of a number of reports regarding various factors associated with FoF, few studies have examined the relationship between FoF and cognitive decline, although it is almost universal in the general elderly population and increases with age [7].

Cognitive impairment, such as impairment of global cognition and executive function, contributes to the deterioration in the ability to carry out tasks in activities of daily living (ADL) [8,9]. Additionally, these cognitive impairments have been identified as a fall risk factor in clinical practice guidelines [10]. FoF also has been recognized as an important psychological factor associated with accidental falls and restricting everyday functioning [11]. However, whether the prevalence of FoF is affected according to the severity

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of cognitive impairment is still unclear. In addition to studying the risk of falling, investigation of FoF may be important in medical management of older adults with cognitive impairment.

Although many studies have reported that global cognitive impairment (GCI) confers a moderate to high risk of serious fall-related injury [10], recent evidence indicates that even mild cognitive impairment (MCI) is a risk factor for falls [12]. MCI is conceptualized to be the earliest feature of cognitive disorders and a prodromal condition between normal and dementia [13]. We have previously reported that memory decline is associated with a lower prevalence of FoF among older adults [14]. However, the sample size of our previous study was relatively small ($n = 101$) and the variety of cognitive impairments (i.e. MCI and GCI) was not considered in that study.

Therefore, the purpose of this study was to examine the effects of severity of cognitive impairment on the prevalence of FoF in a larger cohort of community-dwelling older adults. We hypothesized that mild and global cognitive impairment influence the prevalence of FoF in a different manner because of a difference in the nature of cognitive deficits.

2. Methods

2.1. Participants

We performed a cohort study "Obu Study of Health Promotion for the Elderly" (OSHPE) from August in 2011 to February in 2012. Enrollment in the OSHPE was available to 15,974 older people living in Obu, Japan. Inclusion criteria required that participants lived in Obu and were aged 65 years or older at examination in 2011 or 2012. Before recruitment, 1661 people were excluded because they had participated in another study, required hospitalization or residential care, or were certified as requiring more than level 3 care, requiring support or care by the Japanese public long-term care insurance (LTCI) system. Recruitment was conducted by mail sent to 14,313 people and 5104 people underwent a health check. A total of 4474 subjects satisfied the inclusion criteria and conducted all assessments. The inclusion criterion in this study was persons not certified as any grade requiring support or care by the Japanese public LTCI system. The participants were classified into three groups: cognitive healthy ($n = 2735$; mean age ± standard deviation [SD], 71.3 ± 5.1 years), MCI ($n = 938$; age ± SD = 71.9 ± 5.5 years) and GCI ($n = 801$; age, $M = 74.4 \pm 6.2$ years). GCI was defined as a deficit in general cognitive function; the Mini-Mental State Examination (MMSE) score was 23 or lower [15]. The criteria of MCI were those described by Petersen [13]. These criteria involved the following: (1) having subjective memory complaint, (2) having objective cognitive decline, (3) intact general cognitive function; MMSE score >23 [15], (4) absent from of clinical criteria for dementia, and (5) independent in ADL. Objective cognitive decline was defined as a lower cognitive function in multiple domains more than 1.5 SD from the healthy database. Cognitive functions in multiple domains were assessed using the National Center for Geriatrics and Gerontology-Functional Assessment Tool (NCGG-FAT). NCGG-FAT contains cognitive battery tests and the contents of measurement were described in detail in a previous study [16]. The battery consists of eight tasks to assess memory, attention and execution, processing speed, and visuospatial skill. The term "cognitive healthy" in this study was defined as having intact cognitive ability, and not having objective cognitive impairment. Informed consent was obtained from all participants prior to their inclusion in the study, and the Ethics Committee of the National Center for Gerontology and Geriatrics approved the study protocol.

2.2. FoF/fall history

FoF and fall history was assessed by face-to-face interview with participants. FoF was assessed by a fourth-ordered choice, closed-ended question about participants' general FoF. The question was phrased as follows: "Are you afraid of falling?" Participants who responded "very much" or "somewhat" were assigned to the fear group. Participants who responded "a little" or "not at all" were assigned to the no-fear group [14,17], which has a high test–retest reliability [18]. The question "Do you have any history of a fall within the past year?" was used for detecting fall. A fall was defined as "an unexpected event in which the person comes to rest on the ground, floor, or lower level" [19]. Falls resulting from extraordinary environmental factors (e.g. traffic accidents or falls while riding a bicycle) were excluded. On the basis of their fall history, participants were classified as fallers if they fell twice or more times within the past year [20].

2.3. Potential correlates with FoF

Demographic data were recorded, including age, gender, and educational history. Participants completed a questionnaire on medical condition, including current medications and lifestyle. The medical questionnaire found a variety of diseases (hypertension, heart disease, stroke, and diabetes mellitus) and total medication used administered by a nurse. Depressive symptoms were measured using the 15-item Geriatric Depression Scale (GDS) [21].

The timed up & go test (TUG) was used to assess physical performance [22]. The TUG involves rising from a chair, walking 3 meters, turning around, walking back to the chair, and sitting down. Participants were instructed to complete the task at their usual walking pace. The score for this test represents the time (in seconds) that the participant needed to complete the assessment. Lower times indicate better physical performance. Participants were also asked about their use of walking aids in daily life.

2.4. Statistical analysis

One-way analysis of variance (ANOVA) was used to test differences between groups. When a significant main effect was found from these analyses, the Bonferroni post hoc test was employed was performed to determine differences between pairs of means. The Chi-square test was used to test differences in proportions between groups.

When there is a large number of cell sizes for some of the cross-tabulations, it can be difficult to determine which groups have significant differences within the analyses. Therefore, standardized adjusted residuals were calculated for each of the cells to determine which cell differences contributed to the Chi-square test results. Cells with significant standardized adjusted residuals (>±1.96) are indicated by underlining their percentages in the tables [23,24].

Logistic regression analysis, performed as a stepwise analysis, was carried out to examine whether the classification schema based on cognitive function was independently associated with FoF. In this analysis, the presence or absence of FoF was used as the dependent variable (no-fear = 0, fear = 1). Individual group classification was entered as dichotomous categorical variables (fitting into that group = 1; others = 0). Other independent variables also included possible confounders were age, gender, educational history, TUG, use of walking aids, GDS, and medications. Gender, fall history, and use of walking aids were created as categorical variables (male = 0, female = 1; non-faller = 0, faller = 1; non-user = 0, user = 1). All analyses were performed using commercially available software, IBM SPSS statistics software (Version 20; IBM Corp., Chicago). Statistical significance was set at $p < 0.05$ a priori.