



## The elderly and falls: Factors associated with quality of life A cross-sectional study using large-scale national data in Korea



Jin-Won Noh<sup>a,b</sup>, Kyoung-Beom Kim<sup>c</sup>, Ju Hyun Lee<sup>d</sup>, Byeong-Hui Lee<sup>a</sup>, Young Dae Kwon<sup>e</sup>, Seon Heui Lee<sup>f,\*</sup>

<sup>a</sup> Department of Healthcare Management, Eulji University, Seongnam, Gyeonggi-Do, Republic of Korea

<sup>b</sup> Global Health Unit, Department of Health Sciences, University Medical Centre Groningen, Groningen, The Netherlands

<sup>c</sup> Graduate School of Public Health, Korea University, Seoul, Republic of Korea

<sup>d</sup> Graduate School of Healthcare Management and Policy, The Catholic University of Korea, Seocho-Gu, Seoul, Republic of Korea

<sup>e</sup> Department of Humanities and Social Medicine, College of Medicine and Catholic Institute for Healthcare Management, The Catholic University of Korea, Seocho-Gu, Seoul, Republic of Korea

<sup>f</sup> Department of Nursing Science, College of Nursing, Gachon University, Incheon, Republic of Korea

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### ABSTRACT

**Objective:** To investigate the factors of fall injury and measuring the relationship between health-related quality of life in the elderly.

**Methods:** We analyzed the data on 38,627 persons of aged 65 years or older who have experienced falls drawn from the Korean Community Health Survey 2011. Binomial logistic regression analysis was performed with crude and adjusted odds ratios and 95% confidence intervals.

**Results:** It was found that sex (OR: 1.187), types of household (OR: 1.134), employment status (OR: 0.941), stress (OR: 1.260), comorbidities (OR: 1.308), and health-related quality of life were significantly related to falls among the elderly. Specifically, elderly women, greater stress, comorbidities, and poor health-related quality of life were strongly related to higher odds of falls.

**Conclusion:** Health-related quality of life was significantly related with the risk of fall injuries in elderly households. Providing support for informal caregivers (e.g., friends or neighbors), not only family members could expect to positive effect.

### 1. Introduction

With the rapid growth of the elderly population worldwide, maintenance of health and independence among the elderly is critical. A fall can cause serious consequences in the elderly, including physical injury and disability, decrease of autonomy, loss of confidence, reduction in social activity, and even death. The World Health Organization defines a fall as “an event which results in a person coming to rest inadvertently on the ground or floor or other lower level,” including trips and slips (World Health Organization, 2017). Fall injury can occur in all age groups, but the elderly has been reported to be particularly vulnerable to fall injury due to musculoskeletal changes and joint weakness that render them susceptible to fractures (Liu & So, 2008). The elderly who experience a fall are more likely to receive medical interventions, which increases mortality rate and medical expenses. Furthermore, older adults who survive a fall tend to have a post-falling syndrome of

anxiety, which decreases physical activities and impede normal life patterns because of fear (Murphy, Williams, & Gill, 2002; Suzuki, Ohyama, Yamada, & Kanamori, 2002). It is estimated that approximately 30% of the elderly aged 65 years and older have experienced a fall, and about half of them experienced recurrent falls (Ruchinskas, 2003). The elderly who had a fall are more likely to have serious complications, resulting in death within a year of the injury 50% of the time (Graafmans et al., 1996).

According to the 2013 American Community Survey data provided by the United States Census Bureau, the proportion of single-person households aged 65 and over were increased continuously (U.S. Census Bureau, 2013). In particular, fall injuries are becoming a significant socioeconomic issue for the elderly living alone. Similarly, the elderly living in single-detached houses tend to be more prone to falls due to poorer living conditions and lower incomes. Furthermore, after the fall are more likely to abandon follow-up care due to their lack of social and

\* Corresponding author.

E-mail addresses: [jinwon.noh@gmail.com](mailto:jinwon.noh@gmail.com) (J.-W. Noh), [aefile01287@gmail.com](mailto:aefile01287@gmail.com) (K.-B. Kim), [jhyun290@gmail.com](mailto:jhyun290@gmail.com) (J.H. Lee), [yanoo14@naver.com](mailto:yanoo14@naver.com) (B.-H. Lee), [snukyd1@naver.com](mailto:snukyd1@naver.com) (Y.D. Kwon), [sunarea87@gachon.ac.kr](mailto:sunarea87@gachon.ac.kr), [jhyun290@gmail.com](mailto:jhyun290@gmail.com) (S. Heui Lee).

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economic support (Choi & Lee, 2010).

Numerous studies identified factors of falling; however, most studies examined the general population of the elderly living in local communities and have not specifically looked into the elderly who live alone. Roe et al. (2009) pointed out that an individual's perception of quality of life is a critical factor in predicting fall risk and post-fall intervention. In addition, falls and fear of falling have been reported to be closely associated to health-related quality of life (HRQOL), particularly in the elderly (McLean & Lord, 1996; Scaf-Klomp, Sanderman, Ormel, & Kempen, 2003; Suzuki et al., 2002). According to Ruthazer and Lipsitz (1993) the elderly who rely on others for the basic daily activities owing to difficulties with gait and impaired physical mobility are more likely to experience falls compared with those who are less dependent on others for support. The dependent elderly, who had low subjective ratings of their HRQOL because of difficulty with movement tended to have higher fall frequencies than the independent elderly, who tended to have higher rates of subjective HRQOL (Ruthazer & Lipsitz, 1993). Based on previous studies, we can infer that HRQOL is related to falls. However, the previous study used to small subject samples or perhaps only a specific population. Therefore, it is necessary to study using the national representative cohort to investigate the relationship between HRQOL in the elderly.

We investigated the relationship between falls and HRQOL using large-scale national data in Korea. It was assessed by using the EuroQOL five-dimension questionnaire (EQ-5D), visual analogue scale (VAS), and chronic disease in order to develop a more comprehensive and integrated understanding of fall injury and its contributing factors in the elderly population.

## 2. Methods

### 2.1. Study sample

This study used data from the Korean Community Health Survey (KCHS) conducted by the Korean Centers for Disease Control and Prevention, which obtained from the public repository (<http://chs.cdc.go.kr>). The KCHS is an annual nationwide survey conducted since 2008 to produce community-based comparable health statistics for evaluation of diseases prevention program and community health promotion. The KCHS was conducted on an average of 900 individuals for each community health center, selected by a standardized sampling method of adults aged 19 years or older. In the 2011 KCHS, 229,226 individuals were included. We excluded 190,599 individuals younger than 65 years and any other household type, except those who live alone or those who live with their spouses. Finally, 38,627 individuals (16,884 men and 21,743 women) were included in the analysis. This study was approved by the Institutional Review Board of the Catholic University of Korea with a waiver for informed consent (MC15EISI0011). The study subjects had no identified risks because the survey data were analyzed anonymously.

### 2.2. Variables

Fall injury was used as the dependent variable and assessed based on the question, "Did you experience hurt from a fall this year?" with a yes or no response. In the survey, fall injury included not just those incurred during falls but also those from slips, false steps, and drops. The subjects were divided into two age groups as follows: 65–74 years as the young-old group and 75 or older as the old-old group. Types of household was categorized as "one-person" and "with spouse." The term spouse was applied to individuals who were legally cohabiting or married, and one-person was applied to widowed, divorced, separated, or unmarried individuals. Employment status was categorized as either "no" or "yes". Annual household income was classified into three categories corresponding to "less than 20 million Korean won (KRW; 1USD ≈ 1100 KRW)," "20 to 40 million KRW," and "more than 40

million KRW." Information on stress level was obtained from the question, "How much of stress do you feel in a day?" and answered according to a 4-point scale corresponding to "none," "some stress," "high stress," and "very high stress." We reclassified responses into "no (none or some stress)" or "yes (high and very high stress)". Chronic diseases were defined as hypertension, dyslipidemia, stroke, myocardial infarction, angina pectoris, osteoarthritis, rheumatoid arthritis, pulmonary tuberculosis, asthma, diabetes mellitus, thyroid cancer, atopic dermatitis, renal failure, hepatitis B and C, and liver cirrhosis, based on the Korea National Health and Nutrition Examination Survey. We counted each disease at an individual level and classified them as "none," "1," or "2 or more." We assessed the HRQOL of each subject based on their responses to the EQ-5D questionnaire on KCHS, a generic measure of HRQOL. The EQ-5D is composed of five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression), and each dimension has three levels of indicating severity (no problems/some or moderate problems/extreme problems). The EQ-VAS asks individuals to rate their health status, with 0 to 100 as from the worst to the best health status.

### 2.3. Statistical analyses

Descriptive analysis was performed to identify the general characteristics and distribution of the study participants, calculating the frequencies and percentages for discrete variables, and the mean and standard deviation for continuous variables. We conducted Student's *t*-test, or chi-squared test, respectively, for continuous, or discrete variables to identify the group difference of fall experience. In analyzing the factors associated with falls in elderly households, univariable or multivariable binomial logistic regression analysis was performed, and crude and adjusted odds ratio with 95% confidence interval are reported. The variance inflation factor (VIF) was calculated to check for multicollinearity in multivariable model. All statistics were performed using Stata 14.2 (Stata Corp., College Station, TX, USA) and the threshold for significance was set at 0.05 (two-tailed).

## 3. Results

The general characteristics of the participants are shown in Table 1. The subjects for analysis comprised 38,627 individuals, of whom 16,884 (43.71%) were male and 21,743 (56.29%) were female. 24,538 (63.55%) were classified in the young-old age group. For type of household, 26,083 (67.53%) were living with spouse, regarding employment status, the answers of subjects in 'no' were 22,846 (59.18%). About 30,182 (78.47%) reported having stress, and regarding the number of chronic diseases, the answers of subjects in 'none', 'one kind' and 'two kinds or more' were 6008 (15.91%), 12,325 (32.63%), 19,435 (51.46%). The five dimensions (mobility, self-care, usual activities, pain/discomfort, and anxiety/depression) of EQ-5D reported 674 (1.74%), 674 (1.74%), 1092 (2.83%), 2955 (7.65%) and 944 (2.45%) for unable status/extreme level, respectively. The mean EQ-VAS score was 62.07 (SD 20.50). 8086 (20.95%) reported having fall experience. The results of the chi-squared test or Student's *t*-test showed that all of the variables were significantly differed by fall experiences ( $p < 0.001$ ).

The univariable and multivariable binomial logistic regression analysis was conducted in order to investigate the factors that associated with falls in elderly. The results of the univariable analysis showed that crude effect for the association between fall experience and all of the independent variables or covariates were statistically significant ( $p < 0.001$ ). The adjusted odds of fall injury in the women was 1.187 times higher than that in the men (95% CI 1.116–1.263), and that in the people who lived alone was 1.134 times higher than that in the people who lived with their spouses (95% CI 1.065–1.207). Compared with no stress or having no disease, the adjusted odds of fall injuries increased about 1.3 times in those who had perceived stress

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