Sociodemographic Characteristics and Depression as Risk Factors for Falls among Indonesian Elderly

Susiana Nugraha[1,2], Indri Hapsari Susilowati[2], Sabarinah Prasetyo[2], Supa Pengpid[3,4], Karl Peltzer[4,5]

ABSTRACT

Fall-related injuries among older adults have been recognized as a major cause of morbidity and mortality. Falls and depression are common problems among elderly individuals that generally go undetected and untreated in primary care. The aim of this study was to identify the sociodemographic characteristics and depression as the predictors of the risk of falling among community-dwelling elderly individuals. A cross sectional approach was used for this research, and based on simple random sampling, a total of 427 elderly individuals (>60 years old) were included. The data collection was based on the use of one set of questionnaires consisting of the demographic characteristics (age, sex, education background and economic status), Geriatric Depression Scale, and Johns Hopkins Fall Risk Assessment Tool. The study was conducted from July to September of 2018. Chi-square analysis was used to select variables with the significant association with the risk of falling. Moreover, a multiple logistic regression analysis was employed to identify the most appropriate model for depression and the risk of falling among the elderly participants.

Selection variable performed with chi-square analysis showed that there were associations between age, economic status, living place and depression with fall risk ($p \leq 0.05$). Moreover, the prediction model showed that age and depression were the predictors exhibiting a direct correlation with the fall risk, with risk ratio for ages = 2.281, (95% CI = 1.445-3.601) and Depression = 2.019, (95% CI 1.259-3.239). Those who were aged more than 70 years old were likely to have 2.3 times higher risk of falling compared to those who were aged 60 to 70 years. Those who exhibited depression were likely to have a 2 times higher risk of falling than those elderly who did not have depression. Based on the results of this research, one can conclude that age and depression independently increase fall risk among elderly Indonesian individuals.

Keywords: Sociodemographic; Depression; Fall risk; Elderly

Introduction

The elderly population continues to increase and change the demographic structures of most countries worldwide. According to the World Population Prospects data released by the United Nations Department of Economic and Social Affairs in 2017, the number of elderly people (those aged 60 years or older) has increased significantly in recent years in most countries and regions, and this growth is projected to increase in the coming decades[1]. The National Statistics of Indonesia reported that the proportion of older individuals now exceeds 8%, and it is projected to rise to 13% by 2025 and to 25% by 2050[2]. Moreover, the improvements in people's welfare and health services have significantly increased life expectancy, which reached 70.4 years old in 2017[3], contributing to the increasing elderly population. The increasing number of elderly individuals presents special challenges in the health sector with the emergence of degenerative problems and non-communicable diseases, such as diabetes, hypertension, and mental health disorders (depression, dementia, anxiety disorders and insomnia)[2].

The aging process causes a person to become naturally weakened both physically and psychologically. The elderly face weaknesses, limitations and disabilities that increase the risk of falling. The World Health Organization (WHO) defined a fall as unwittingly coming to rest on the ground, floor or other lower level, without an intentional change in position toward the furniture, walls or other objects[4]. Fall-related injuries in older adults have been recognized as a major public health issue that increase mortality and morbidity[5,6]. The risk factors for falls include muscle weakness, a history of falling, polypharmacy (using three or more prescribed medications), the use of assistive tools, arthritis, age, sex and impairments in the gait, balance, cognition, vision, the ability in performing activities of daily living and depression[7-10].

Depression is the most common mental health disorder that can affect an individual's social and physical wellbeing, and a poor health status has been reported as a risk factor for depression[11-13]. Depression causes serious symptoms that can affect an elderly individual's feelings, thinking and the way that they handle daily activities, such as sleeping, eating and working. Depression among the elderly may be difficult to recognize because they may show different symptoms of depression than those seen in younger people. In some cases of depression in elderly patients, sadness is not the main symptom. They may have other, less obvious symptoms of depression, or they may be reluctant to talk about their feelings[14]. Depression in older adults might be different from depression earlier in life in terms of

appearance, aetiology, risk and protective factors, and potential outcomes all reflect aspects of the older adult's position in the lifespan[15].

Falls are a common problem among elderly people, and an estimated 424,000 fatal fall cases occur every year, making it one of the main causes of death due to accidental injury in the elderly[16]. More than 80% of fall-related deaths occur in low- and middle- income countries, with the Western Pacific region and Southeast Asia accounting for more than two-thirds of the deaths among adults over the age of 60 years[17]. National injury prevalence data demonstrate that one of the most common causes of injury among the elderly is falling. The fall prevalence among individuals aged 65 to 74 years old was 67.1%, and for those older than 75 years, it was 78.2% in the past year[18].

Falls among elderly people are the result of several risk factors across the biological and behavioural aspects of an individual, along with environmental factors[10]. Falls can trigger a decline in daily life activities, independence and the overall health outcomes of the elderly. A risk of fall assessment is required for clinicians who provide care for elderly patients, and the assessment should be performed at least once each year. A comprehensive fall risk assessment that involves various factors can provide benefits by reducing the morbidity and mortality caused by falls. This assessment is also beneficial for improving the quality of life of elderly patients. An effective fall prevention strategy has the potential to reduce serious fall-related injuries, emergency room visits, hospitalizations, institutionalizations and functional decline.

The symptoms of depression may have a direct role in promoting falls. Prolonged depression is one cause of sleep disturbances, fatigue and physical tiredness that may increase fall risk in elderly people[19]. The development of a clearer understanding of the causes of depression would help to formulate a more effective program for prevention and treatment. Another prospective study found that depression was a risk factor for falls among the elderly[7,11,20,21]. Depression may overtake an incidence of falling or vice versa. It can also be the result of a third factor that develops simultaneously and adversely affects the health of an elderly individual. The prevention and treatment of depression could greatly benefit the health and wellbeing of the elderly population[22], as well as reduce the fall risk.

The purpose of this study was to identify the associations between geriatric depression and the risk of fall among community-dwelling elderly individuals.

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Materials and Methods

In this study, a cross sectional approach was used to identify the relationships between geriatric depression and the risk of falling among elderly individuals. Simple random sampling was used to select a total of 300 elderly individuals (>60 years old) living in the community in three provinces, including Daerah Khusus Ibukota Jakarta, West Java and Yogyakarta. This study was conducted from July to September of 2018.

The data collection consisted of the use of one set of questionnaires, which included demographic characteristics (age, sex, education background and economic status). Depression status was measured using the Geriatric Depression Scale (GDS), and the Johns Hopkins Fall Risk Assessment Tool (JHFRAT) was used to identify the risk of falling among the elderly participants. We also identified the use of antidepressant medications.

The GDS was first created by Yesavage et al in 1983, and it has been tested and used extensively in the elderly population[23]. The long form of the GDS consists of a 30-item questionnaire in which the participants are asked to respond by answering yes or no in reference to how they felt over the past week[23]. The Short Form GDS was created later, in 1986, and it consists of 15 questions[24]. The questions from the long form of the GDS that had the highest correlation with depressive symptoms in the validation studies were selected for the short version. Of the 15 items, 10 indicated the presence of depression when answered positively, while the rest indicated depression when answered negatively. Scores of 0-4 are considered to be normal, 5-8 indicate mild depression, 9-11 indicate moderate depression and 12-15 indicate severe depression. This study used a categorical score, and the cut-off score was greater than 5, indicating that a score of ≥6 suggested depression. The Cronbach's alpha for this scale in this sample was 0.714.

The JHFRAT was selected to measure the risk of falling among the elderly participants. The JHFRAT was developed as part of an evidence-based fall safety initiative. This risk stratification tool is valid, reliable and highly effective when combined with a comprehensive protocol and fall prevention products and technologies. A prospective cohort study was conducted in southern California to evaluate the validity and reliability of the modified JHFRAT (mJHFRAT) among elderly patients receiving home care visits[25]. The mJHFRAT includes seven areas of evaluation: the patient's age, prior fall history, elimination, medications, use of patient care equipment, mobility and cognition. Another study conducted by Archuleta showed that mJHFRAT is a simple fall risk assessment tool with promising

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sensitivity, specificity and inter-rater reliability for prospectively identifying patients at risk of falling with injury among community-dwelling elderly populations[26]. This study utilized mJHFRAT as the outputs in categorized groups, namely low risk of falling with score 0-5 and moderate risk of falling with a score more than 6.

All of the procedures performed in this study involving human participation were conducted in accordance with the institutional and research committee's ethical standards. Informed consent was obtained from all of the individual participants included in this study. This study was approved by the Ethical Committee of the Faculty of Public Health at the University of Indonesia (Approval Number: 125/UN2.F10/PPM.00.02/2018).

Statistical analyses were carried out using IBM SPSS Statistics for Windows Version 21.0 (IBM Corp., Armonk, NY, USA). Descriptive statistics were calculated to describe the sociodemographic characteristics of the study participants, the distribution of depression and the risk of falling among the elderly participants. A bivariate analysis was conducted using a chi-squared test to screen the model predictors for fall risk among the elderly participants. A multiple logistic regression was used to identify the association between depression and the risk of falling (moderate and high risk). The model was adjusted for the sociodemographic characteristics and the health variables in order to identify the independent contribution of depression to the risk of fall.

Results

A total of 427 of the 460 questionnaires had no missing data, and were therefore used for the data analysis. The response rate for this study was 92.8%. None of the study participants used antidepressant medications. Sociodemographic characteristics of study participants are shown in Table 1. The average age of the study participants was 73.8 years old, SD = 10.1, minimum = 60, maximum = 102; 67.9% of them were female, 49.2% of study participants had no formal education, 78.2% of participants had no fixed income, 50.1% were living in institutionalized elderly homes and 49.9% of them were living in the community. In the analysis of fall risk, the results showed that 34.4% of the study participants had moderate risk of falls and 65.6% had low risk of falls. The depressive score showed that 25.1% of the study participants exhibited depression.

Table 1 Sociodemographic characteristics of study participants

Variables	Category	Number	%
Age (years)	60-70	242	56.7
	Over 70	185	43.3
Sex	Female	290	67.9
	Male	137	32.1
Educational	No formal education	210	49.2
Background	Formal education	217	50.8
Economic Status	No fixed income	334	78.2
	Fixed income	93	21.8
Living Place	Institutionalized elderly home	214	50.1
	Community	213	49.9
Fall Risk (JHFRAT)	Moderate	147	34.4
	Low	280	65.6
Depression (GDS)	>5 (Depressive)	107	25.1
	<5 (Non-depressive)	320	74.9

GDS: Geriatric Depression Scale

JHFRAT: John Hopkins Fall Risk Assessment Tool

The bivariate analysis was performed to select predictor variables to be included in the regression model. As shown in Table 2, that there were significant correlations between the risk of falling with age, economic status, living place, and depression ($p \leq 0.05$). Sex and educational background did not show any significant correlation with fall risk. All predictor variables matching the criteria were included in the regression model with $p \leq 0.25$.

As shown in Table 3, the prediction model for risk of falling among the elderly showed that age and depression were the predictors exhibiting a direct correlation with fall risk with risk ratio for age = 2.281, (95% CI = 1.445-3.601), whereas those who were aged over 70 years old were likely to have 2.3 times higher risk of falling compared to those who were aged 60 to 70 years. Moreover, the risk ratio for depression was 2.019 times (95% CI 1.259-3.239), whereas those who exhibited depression were likely to have a two times higher risk of falling than those elderly who did not have depression.

Table 2 The association between sociodemographic characteristics, depression and fall risk

Variables	Category	Fall Risk		p
		Moderate	Low	
Age (years)	60-70	105 (71.4%)	137 (48.9%)	0.001
	Over 70	42 (28.6%)	143 (51.1%)	
Sex	Female	107 (72.8%)	183 (65.4%)	0.118
	Male	40 (27.2%)	97 (34.6%)	
Educational Background	No formal education	78 (53.1%)	132 (47.1%)	0.240
	Formal education	69 (46.9%)	148 (52.9%)	
Economic Status	No fixed income	123 (83.7%)	211 (75.4%)	0.048
	Fixed Income	24 (16.3%)	69 (24.6%)	
Living Place	Institutionalized elderly home	85 (57.8%)	129 (46.1%)	0.021
	Community	62 (42.2%)	151 (53.9%)	
Depression (GDS)	Depressive	52 (35.4%)	55 (19.6%)	0.001
	Non-depressive	95 (64.6%)	225 (80.4%)	

Table 3 Prediction model for fall risk

Variables	Regression Coefficient	Wald	p	OR	95% CI for OR	
					Lower	Upper
Age (>70 years ref.)	0.825	12.543	0.001*	2.281	1.445	3.601
Sex (Female ref.)	0.255	1.088	0.297	1.290	0.799	2.081
Educational Background	0.099	0.419	0.518	1.104	0.818	1.491
Economic Status	0.016	0.003	0.960	1.016	0.549	1.880
Living Place	0.230	0.883	0.347	1.258	0.779	2.031
Depression	0.703	8.497	0.004*	2.019	1.259	3.239
Constant	-0.456	3.355	0.067	0.634		

Discussion

The results of this study confirmed that age and depression are predictors for fall risk among the elderly population. Other variables, such as sex, educational background, economic status, and living place did not show any significant correlations in the predictor model.

This study confirms that elderly who are older than 70 years old are likely to have two times higher risk of falling compared to those who are younger (60-70 years old). Older age is in line with the level of frailty as a result of decreasing functional status, which may increase the risk of falls among older people. Age is one of the key risk factors for falls. Older people have the highest risk of death or serious injury arising from a fall and the risk increases with age[10]. This risk level may be in part due to physical, sensory, and cognitive changes associated with ageing, in combination with environments that are not adapted for an aging population. This finding is also in line with a study conducted by Archuleta who found that the risk of falling increases as the elderly get older[26].

Falls are common in elderly people but the risk increases significantly when they have depressive symptoms. This study finding is in accordance with the study conducted by Hirase et al, which showed that depression

was a risk factor for falling, and that being more depressed was linked to a higher fall risk[27]. Another study, conducted by Avionita tried to identify the relationship between depression and the risk of falls among elderly individuals[28]; it showed that there was a positive relationship, and the authors concluded that a higher level of depression in elderly individuals resulted in an increased risk of falls and *vice versa*[28]. The occurrence of falls can trigger the emergence of depressive symptoms as well as a fear of falling among elderly individuals living in the community. In addition to those elderly individuals who have experienced a fall, the fear of falling is also becoming a problem for those who have never fallen. Nonetheless, the evidence for depression as a result of falling is less compelling than the evidence of depression causing falls. These findings are in line with the study conducted by Biderman et al who identified a statistical correlation between depression and the risk of falls among community-dwelling elderly individuals, although the order of causation was not clear[11].

The results of this study showed that elderly individuals who experienced depression had moderate risk of falls. None of the elderly participants were using antidepressant medications; therefore, it can be assumed that the risk of falls in the elderly participants in this study was not related to the side

effects of antidepressant medications. Although it was not further investigated, the relationship between depression and falls can be assumed to be a vice versa relationship. Falls and depression are two geriatric symptoms that are commonly interrelated. However, more studies are needed to further investigate their correlation. Additional investigations will be beneficial for strengthening the prevention efforts, increasing early detection and determining appropriate treatment. This effort is expected to improve the quality of life for the rapidly growing elderly segment of the population. A community approach that addresses elderly empowerment toward physically improving their strength and balance, as well as preventing depressive symptoms, is greatly needed.

Depressive symptoms are a potentially modifiable risk factor for falls and should therefore be addressed in fall prevention programs, especially in high-risk populations. Community interventions for older people experiencing depression should focus on a combination of physical exercise, including resistance and balance training, and psychosocial therapies such as mindfulness.

Author contributions

SN, IS, SP, KP and PS designed the study and formulated the content of the instrument. SN and IS carried out reliability testing, data collection and the initial statistical analysis of data under supervision of IS. SP, PS, KP guided data interpretation and manuscript preparation. All authors read and approved the manuscript prior to submission for publication.

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Conflicts of interest

The authors declare that there are no conflicts of interest.

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