PREVALENCE AND CORRELATES OF IMPAIRMENTS IN ACTIVITIES OF DAILY LIVING IN OLDER KOREANS: COMPARISON OF YOUNG-OLD AND OLD-OLD

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ABSTRACT

Background and Objective
Societal aging and increasing average life expectancy have led to a significant increase in the population of individuals aged 75 years or above. Hence, it is becoming more meaningful and appropriate for researchers to divide those above the age of 65 years into various subgroups, such as young-old and old-old. Based on this division, we investigated the prevalence and correlates of impairments in activities of daily living (ADLs) among community-dwelling older adults (young-old vs. old-old) in South Korea.

Material and Methods
This was a cross-sectional study. We used the data of 4,368 older adults (≥65 years old) from the 2012 Korean Longitudinal Study of Aging. ADL impairment was assessed using a modified version of the Katz Index of Independence in Activities of Daily Living.

Results
The prevalence of ADL impairment was greater in old-old participants (12.7%) than in young-old ones (3.0%). ADL impairment was significantly associated with gender, perceived health status, regular exercise, cognitive function, and depressive symptoms in young-old individuals. By contrast, in old-old individuals, the significant predictors were residential area, socioeconomic status, perceived health status, regular exercise, cognitive function, and depressive symptoms. Among both age subgroups, cognitive function was the strongest predictive factor of ADL impairment.

Conclusion
We found clear age differences in the prevalence and correlates of ADL impairment in older Koreans. Such age differences should be considered when studying and developing interventions for ADL impairment in older adults.

Key Words: *activity of daily living, disability, elderly, prevalence*

INTRODUCTION

The life span of the elderly individuals in South Korea is increasing; in 2016, the average life expectancy of Koreans was 82.4 years, a gain of 20.1 years compared to that in 1970 (62.3 years).[1] However, disease-free life expectancy (the period of maintaining a healthy status without disease or injury) was only 64.9 years in 2016; in other words, elderly Koreans were living in an unhealthy state for an average of 17.5 years.[2]

Older adults require good physical functions to enjoy healthy lives for as long as possible. A healthy life is not merely free of disease but also requires relative independence in daily activities.[3] Many older persons face difficulties in performing daily activities independently because of their higher likelihood of contracting diseases and experiencing deteriorations in physical functions.[4] When evaluating older people's physical functions, it is inadequate to merely seek diagnoses of specific diseases; rather, it is recommended that they receive an overall assessment of impairments in their physical functional status and the degree of such impairments.[5]

Researchers have conceived various methods of objectively evaluating physical functional status among older adults, with the most common being an assessment of activities of daily living (ADLs).[6] ADLs consist of basic ADLs (i.e., the minimum physical ability required for an individual to live independently) and instrumental ADLs (i.e., the skills and abilities required for independent social activities).[7] ADLs are known to substantially influence older adults' lives as a whole.[8] Severe ADL impairment places a heavy burden on both the older adults and their families. Thus,

maintaining independence in performing ADLs is crucial to both the older adult and his/her family.

The majority of ADL-related studies conducted in South Korea have targeted select urban or rural areas or are limited to selected groups of community members (e.g., older adults who use day care centers).[9–12] This selective focus has naturally limited the ability to generalize the studies' results. Furthermore, these studies have typically focused on select correlates of ADLs, which prevents a comprehensive understanding of the related factors.

Rather than considering older adults (i.e., those aged 65 years and older) a homogenous group, it may be more meaningful and appropriate for researchers to divide this age group into subgroups, such as the young-old and the old-old.[13] This is especially true in light of the abovementioned increase in average life expectancy, which causes a significant increase in the population of those aged 75 years or above. Studies have highlighted several differences between the young-old and the old-old, particularly in terms of the degree of daily activities, support from family and society, and health status. Thus, they likely require differentiated approaches for research or nursing interventions.[13,14] Despite South Korea's extended period of old age, relatively few studies have attempted comparisons among these subgroups of old age. Therefore, we compared physical functional status and its related factors between the young-old and old-old, utilizing data from the Korean Longitudinal Study of Aging (KLoSA) conducted by the Korea Employment Information Service in 2012.

METHODS

Data and Study Population

We used data collected in the fourth wave of the KLoSA. The KLoSA has been conducted biannually since 2006 by the Ministry of Employment and Labor and the Korea Employment Information Service. Its objective is to obtain basic data that can be utilized in the development and implementation of socioeconomic institutions as Korea moves toward an aged society. The survey items were selected to cover the major factors affecting the economic and social activities of middle-aged and older adults, and they include eight categories: population, family, health, employment, income, property, subjective expectations, and quality of life. The fourth-wave data were collected in 2012 and published in 2013. The participants were all aged 45 years or above. We downloaded the raw data in the SPSS Statistics format, following the steps prescribed by the Korea Employment Information Service. In this study, we used the data of 4,368 individuals aged 65 years or above, having screened out those who did not provide the necessary data. Ethics approval for our study was obtained from the Ministry of Employment and Labor and the Korea Employment Information Service.

Dependent and Independent Variables

For this study, we extracted variables found to be related to older adults' ability to perform ADLs in previous local and international studies. These included gender, age, education level, residential area, socioeconomic status, perceived health status, regular exercise and diet, chronic disease, cognitive function, and depressive symptoms.

The KLoSA adopted the instrument developed by Won et al. to assess Korean older adults' ADLs, which assesses their living environments and cultures.[15] Namely, ADL impairment was assessed using a modified version of the Katz Index of Independence in Activities of Daily Living. Participants were considered to be "independent" in performing ADLs only when they answered "independent" for all seven items (dressing, washing, bathing, eating, ambulating, toiling, and sphincter control).

Participants were divided based on their age into the young-old (65–74 years) and the old-old (75 years or above) groups. Based on their education level, they were divided into elementary school, middle school, high school, or college graduates. Based on their socioeconomic status, they were divided into high, middle, and low socioeconomic groups. Based on their perceived health status, they were divided into "good" (for responses of "very good" and "quite good"), "not bad or good," and "bad" (for responses of "bad" and "very bad"). Participants were deemed to engage in regular exercise when they exercised for 150 min or more per week (the recommended level of exercise), while they were deemed to have a regular diet if they had not skipped any meal in the last two days.

Participants were considered to have a chronic disease if they were diagnosed with any of the following: hypertension, diabetes mellitus, arthritis, pulmonary disease, cerebrovascular disease, cancer, liver disease, mental disease, or prostate disease. Based on their cognitive function, they were divided into those with normal cognitive function, lowered cognitive function, and at high risk for dementia according to the standards of gender, age, and education, as assessed using the Mini-Mental State Examination in the Korean version of the Consortium to Establish a Registry for Alzheimer's Disease Assessment Packet (MMSE-KC).[16,17] Finally, depressive symptoms were assessed using a 10-item Korean version of the Center for Epidemiological Studies-Depression scale,[18] and its validity and reliability were confirmed.[19] Based on their scores on the scale, participants were categorized into two groups: those with "no depressive symptoms" (0–3 points) and those "having depressive symptoms" (4 points and above).

Statistical Analysis

We used SPSS Statistics 20.0 (IBM Corp., Armonk, NY, USA) for data analysis. Frequencies and percentages were used to measure the degree of ADL impairment in the young-old and the old-old groups. We evaluated differences in the degree of ADL impairment between the age subgroups using the χ^2-test. A multiple logistic regression analysis was conducted to identify the determinants of ADL impairment. The Hosmer–Lemeshow test was conducted to evaluate the model's goodness of fit. Statistical significance was set at 0.05.

RESULTS

Comparison of Characteristics of the Young-Old and the Old-Old

We observed a significant difference between the young-old and the old-old for all characteristics (Table 1). Specifically, the old-old group comprised a higher proportion of women (p=0.003), as well as individuals with a lower education level (p<0.001), living in rural areas (p=0.006), with a lower socioeconomic status (p<0.001), with good perceived health status (p<0.001), engaging in irregular exercise (p<0.001) or an irregular diet (p=0.012), with chronic disease (p<0.001), with poor cognitive function (p<0.001), and with depressive symptoms (p=0.001). Of all participants, 8.3% had impaired ADL, and the prevalence was significantly higher among the old-old (12.7%) than among the young-old (3.0%) (p<0.001).

Participants' Characteristics Associated with ADL Impairment in the Young-Old and Old-Old

In the young-old group, we observed differences in ADL impairment according to gender (p=0.001), socioeconomic status (p=0.018), perceived health status (p<0.001), regular exercise (p<0.001), chronic disease (p<0.001), cognitive function (p<0.001), and depressive symptoms (p<0.001). In contrast, in the old-old group, we observed significant differences in all variables except for regular diet (p=0.387) (Table 2).

Factors Affecting ADL Impairment in the Young-Old and the Old-Old

The results of a logistic regression analysis, performed to identify factors affecting ADL impairment in the young-old and the old-old, are shown in Table 3. In the young-old group, the odds of ADL impairments were 4.776 times greater (odds ratio=4.776, 95% confidence interval [CI]=2.631–8.669) in men than in women; 10.518 times greater (95% CI=4.005–27.620) in participants with poor perceived health status than in those with neutral perceived health status; 3.450 times greater (95% CI=1.557–7.470) in participants who did not engage in regular exercise than in those who did; 2.502 (95% CI=1.069–5.853) and 18.379 times greater (95% CI=9.084–37.184) in participants with lowered cognitive function and at high risk of dementia, respectively; and 2.200 times higher (95% CI=1.087–4.451) in those with depressive symptoms than in those without these symptoms.

By contrast, among the old-old group, the odds of ADL impairment were 1.426 times greater (95% CI=1.025–1.983) in individuals living in urban areas than in those living in rural areas; 1.485 times greater (95% CI=1.049–2.102) among participants with a low socioeconomic status than among those with a middle status; 5.476 times greater (95% CI=3.482–8.611) among those with poor self-perceived health status than among participants with neutral perceived health status; 1.931 times higher (95% CI=1.186–3.143) in individuals not engaged in regular exercise than in those engaged in regular exercise; 3.086 (95% CI=1.768–5.388) and 11.990 times higher (95% CI=7.221–19.907) in participants with lowered cognitive function and at high risk of dementia, respectively; and 2.333 times greater (95% CI=1.581–3.441) among individuals

TABLE 1 Characteristics of Subjects by Age Group

Characteristics	Categories	Young-old people (n=2,270)		Old-old people (n=2,098)		χ²	p
		n (%)		n (%)			
Gender	Male	1,015	(44.7)	844	(40.2)	8.97	0.003
	Female	1,255	(55.3)	1,254	(59.8)		
Education	≤Elementary school	1,227	(54.1)	1,566	(74.6)	109.37	<0.001
	≥Middle school	1,043	(45.9)	532	(25.4)		
Residential area	Urban	1,624	(71.5)	1,421	(67.7)	7.50	0.006
	Rural	646	(28.5)	677	(32.3)		
Socioeconomic status	High	496	(21.9)	348	(16.6)	63.11	<0.001
	Middle	810	(35.7)	608	(29.0)		
	Low	964	(42.5)	1,142	(54.4)		
Perceived health status	Good	502	(22.1)	237	(11.3)	203.30	<0.001
	Normal	1,039	(45.8)	766	(36.5)		
	Poor	729	(32.1)	1,095	(52.2)		
Regular exercise	No	1,432	(63.1)	1,579	(75.3)	75.51	<0.001
	Yes	838	(36.9)	519	(24.7)		
Regular diet	No	118	(5.2)	147	(7.0)	6.26	0.012
	Yes	2,152	(94.8)	1,951	(93.0)		
Chronic diseases	No	642	(28.3)	410	(19.5)	45.55	<0.001
	Yes	1,628	(71.7)	1,688	(80.5)		
MMSE-KC	Normal	1,570	(69.2)	825	(39.3)	457.08	<0.001
	Low	465	(20.5)	594	(28.2)		
	High risk of dementia	235	(10.4)	679	(32.4)		
Depressive symptoms	No	2,123	(93.5)	1,906	(90.8)	10.91	0.001
	Yes	147	(6.5)	192	(9.2)		
ADL impairment	No	2,201	(97.0)	1,832	(87.3)	143.06	<0.001
	Yes	69	(3.0)	266	(12.7)		

ADL = activity of daily living; MMSE-KC = Mini-Mental State Examination in the Korean version of the Consortium to Establish a Registry for Alzheimer's Disease (CERAD) Assessment Packet.

with depressive symptoms than among those without such symptoms.

DISCUSSION

We assessed Korean older adults' physical functional status and its influential factors by utilizing representative nationwide data. As a departure from past studies, we divided participants into the young-old and the old-old groups, which is of particular significance in South Korea owing to the rapid extension of old age attributed to increased life expectancy. We found significant

TABLE 2 Distribution of Factors Related to the Activities of Daily Living by Age Group

Category	Classification	Young-old people (n=2,270)			Old-old people (n=2,098)		
		Normal	Impaired	χ² (p)	Normal	Impaired	χ² (p)
Gender	Male	95.7	4.3	10.45	89.6	10.4	8.47
	Female	98.0	2.0	(0.001)	85.8	14.2	(0.011)
Education	≤Elementary school	96.9	3.1	0.30	85.4	14.6	21.09
	≥Middle school	97.0	3.0	(0.863)	93.0	7.0	(<0.001)
Residential area	Urban	96.8	3.2	0.51	86.1	13.9	6.27
	Rural	97.4	2.6	(0.475)	90.0	10.0	(0.012)
Socioeconomic status	High	98.4	1.6		91.1	8.9	
	Middle	97.4	2.6	8.00	88.3	11.7	7.94
	Low	95.9	4.1	(0.018)	85.6	14.4	(0.019)
Perceived health status	Good	99.4	0.6		99.2	0.8	
	Normal	99.5	0.5	103.45	96.7	3.3	174.08
	Poor	91.6	8.4	(<0.001)	78.2	21.8	(<0.001)
Regular exercise	No	95.8	4.2	17.42	84.6	15.4	42.36
	Yes	98.9	1.1	(<0.001)	95.6	4.4	(<0.001)
Regular diet	No	94.1	5.9	3.53	85.0	15.0	0.75
	Yes	97.1	2.9	(0.060)	87.5	12.5	(0.387)
Chronic diseases	No	99.2	0.8	15.53	90.5	9.5	4.62
	Yes	96.1	3.9	(<0.001)	86.6	13.4	(0.032)
MMSE-KC	Normal	99.2	0.8		97.7	2.3	
	Low	97.6	2.4	233.69	91.8	8.2	257.35
Depressive symptoms	High risk of dementia	80.9	19.1	(<0.001)	70.8	29.2	(<0.001)
	No	97.7	2.3	67.45	89.3	10.7	77.38
	Yes	85.7	14.3	(<0.001)	67.2	32.8	(<0.001)

ADL = activity of daily living; MMSE-KC = Mini-Mental State Examination in the Korean version of CERAD Assessment Packet.

differences in all variables between these two age groups, which supports the findings of previous studies implying that considering individuals aged 65 years or above as a homogeneous age group can lead us to overlook existing differences between subgroups of old age.[14,20] Especially, there were significant differences in disability and presence of chronic disease between the male and female elderly.[21] These differences further suggest that a differentiated approach for subgroups of old age and gender is essential when developing and implementing interventions.

We found an overall prevalence of ADL impairment of 8.3%, which is higher than that (7.2%) found in a survey of living conditions and welfare needs among Korean older persons (in 2011) and lower than that (17.7%) found in the Korean National Health and Nutrition Examination Survey (in 2005). These differences might reflect differences in the measurement instruments used in each study, and distinctiveness of the samples, sampling time, or the sampling process.[22,23] However, the prevalence was somewhat lower than that found (9.6%) in the

TABLE 3 Logistic Regression Analysis of Factors Affecting on Impairments in Activities of Daily Living by Age Group

		Young-old people			Old-old people		
		OR	95% CI	p	OR	95% CI	p
Gender	Female	1.000			1.000		
	Male	4.776	2.631–8.669	<0.001	0.765	0.549–1.032	0.078
Education	≥Middle school	1.000			1.000		
	≤Elementary school	1.298	0.501–3.360	0.591	1.145	0.688–1.905	0.603
Residential area	Rural	1.000			1.000		
	Urban	1.385	0.729–2.632	0.320	1.426	1.025–1.983	0.035
Socioeconomic state	Middle	1.000			1.000		
	High	0.715	0.277–1.845	0.488	0.830	0.499–1.381	0.473
	Low	1.095	0.567–2.115	0.788	1.485	1.049–2.102	0.026
Perceived health status	Normal	1.000			1.000		
	Good	1.991	0.457–8.767	0.357	0.241	0.056–1.042	0.057
	Poor	10.518	4.005–27.620	<0.001	5.476	3.482–8.611	<0.001
Regular exercise	Yes	1.000			1.000		
	No	3.450	1.557–7.470	0.002	1.931	1.186–3.143	0.008
Regular diet	Yes	1.000			1.000		
	No	0.953	0.349–2.604	0.925	0.823	0.428–1.221	0.225
Chronic diseases	No	1.000			1.000		
	Yes	2.663	0.950–7.468	0.063	0.856	0.537–1.237	0.462
MMSE-KC	Normal	1.000			1.000		
	Low	2.502	1.069–5.853	0.034	3.086	1.768–5.388	<0.001
Depressive symptoms	High risk of dementia	18.379	9.084–37.184	<0.001	11.990	7.221–19.907	<0.001
	No	1.000			1.000		
	Yes	2.200	1.087–4.451	0.028	2.333	1.581–3.441	<0.001

ADL = activity of daily living; CI = confidence interval; MMSE-KC = Mini-Mental State Examination in the Korean version of the CERAD Assessment Packet; OR = odds ratio.

first wave of the KLoSA (in 2006), which utilized the same research method as this study.[23] This decreasing trend could be related to increased socioeconomic status and attention to the healthy living of aging persons, although a replication study should be conducted to confirm this.

The old-old group showed a higher prevalence of ADL impairment (12.7%) than did the young-old (3.0%) group. This corresponds with the findings of previous studies,[3,9,22,24] and could be attributed to age-related decrements in physical functions. This finding further emphasizes that the age group comprising those aged 65 years or above should not be regarded as a homogenous age group for geriatric interventions.

The young-old and old-old groups also showed differences in terms of the factors affecting ADL impairment. In both groups, perceived health status, regular exercise, cognitive function, and depressive symptoms affected ADL impairment.

In other words, the odds of ADL impairment were high among older adults with poor perceived health status and those who did not engage in regular exercise or had lowered cognitive function or depressive symptoms. This finding is similar to those of studies that investigated older adults as a homogenous group.[11,23,25,26] However, gender (male and female) was associated with ADL impairment only among the young-old group, whereas residential area and socioeconomic status were related to ADL impairment only among the old-old group.

Elderly women have been found to have greater limitations in ADLs compared to elderly men.[27,28] However, in this study, the opposite was true for young-old participants. The reason why the risk of ADL limitation was high in young-old men is assumed to be related to gender difference in stroke incidence. Stroke is one of the important factors of ADL impairments.[29,30] Stroke prevalence in men was about twice higher than that in women in their 50s–60s,[31] indicating that ADL limitation risk was higher in early elderly males. In general, post-elderly females show higher incidence of ADL disabilities compared with males.[32] That is, the proportion of females is high among the post-elderly. Furthermore, the prevalence of chronic disease and their complications increases with aging.[21,33] However, in this study, ADL limitation was higher in old-old women than in elderly men, although the difference was not significant. Further studies confirming this finding should be conducted.

Among the factors influencing ADL disability, cognitive function was the most significant. Lowered cognitive function is a common sign of the progress of aging that can lead to greater agitation, anxiety, and mental stress in older adults.[34] Thus, early intervention is necessary to delay the onset of cognitive problems. According to a previous study, close observation of elderly adults' daily activities, particularly their cognitive function, can help in recognizing symptoms of dementia.[12,35,36] In addition, ADL limitations are a highly important indicator of possible mental disorders, memory disorders, and personality changes. Thus, periodic assessment and evaluation of the ADLs of older adults in the community are necessary for good mental health management. Unfortunately, much like our study, past studies have focused on the correlation between cognitive function and ADL impairment[12,27]; there is currently no study examining their causal relations. Thus, a large-scale cohort study should follow to determine the causal relations.

This study has some limitations. First, since the data collection of the KLoSA relied on the responses of elderly adults or their family members, we cannot rule out possible response bias. Second, because this study is cross-sectional in nature, we cannot make assumptions about the causal relations between ADL impairment and the various related factors. A more extensive analysis should be conducted using a cohort design. However, despite these limitations, this study has significance in its consideration of two subgroups of older adults—it is one of the first studies to explore differences in ADL impairment and its influential factors between the young-old and the old-old.

CONCLUSION

We explored Korean older adults' physical functional status and its related factors using representative nationwide data. We found significant differences in the prevalence of ADL impairment between the young-old (3.0%) and the old-old (12.7%) groups. The influential factors also differed; although perceived health status, regular exercise, cognitive function, and depressive symptoms were related to ADL impairment in both age groups, gender was relevant only in the young-old group, while residential area and socioeconomic status were relevant only in the old-old group. These results imply that these age differences should be considered in geriatric nursing research and interventions, rather than considering all elderly persons as a single group. We therefore

suggest the development of more comprehensive and practical programs and translational research studies considering these age differences.

CONFLICT OF INTEREST

The authors declare that they have no conflicts of interest.

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