

## Factors Influencing Depressive Symptoms among Korean Older Adults with Chronic Illnesses: Using the 2014 National Survey on Older Adults



Shin, Sujin<sup>1</sup> · Hwang, Eunhee<sup>2</sup>

<sup>1</sup>Associate Professor, College of Nursing, Ewha Womans University, Seoul, Korea

<sup>2</sup>Professor, Department of Nursing, Wonkwang University, Iksan, Korea

**Purpose:** Geriatric depression is often closely connected with physical symptoms among older adults. This study aimed to determine the factors related to depressive symptoms among older adults with multiple chronic diseases.

**Methods:** We assessed 6,672 older adults using data extracted from the 2014 National Survey on the Elderly in Korea. The short form of the Geriatric Depression Scale and the Korean versions of the Mini-Mental State Examination for dementia screening and the DETERMINE Your Nutrition Health Checklist were used. Statistical analyses included independent t-test,  $\chi^2$  test, and logistic regression analysis. **Results:** We found that 36.7% of the older adults exhibited depressive symptoms, and the average score on the short form of the Geriatric Depression Scale was  $5.90 \pm 4.53$ . The factors significantly related to depressive symptoms were unemployment (Odds Ratio [OR]=1.85, 95% Confidence Interval [CI]=1.59~2.15), "high risk" nutritional management status (OR=1.19, 95% CI=1.16~1.22), slight visual dysfunction (OR=1.21, 95% CI=1.05~1.38), high visual dysfunction (OR=1.41, 95% CI=1.04~1.91), slight hearing dysfunction (OR=1.22, 95% CI=1.05~1.43), slight chewing dysfunction (OR=1.37, 95% CI=1.19~1.59), high chewing dysfunction (OR=1.59, 95% CI=1.30~1.95), low cellphone utilization (OR=1.60, 95% CI=1.04~2.46), older age (OR=0.99, 95% CI=0.98~1.00), and higher educational level (OR=0.96, 95% CI=0.95~0.98).

**Conclusion:** Preventive interventions for depressive symptoms should include nutritional education programs, functional assistive devices, and the use of information technology.

**Key Words:** Aging, Depression, Chronic disease, Cognition, Nutritional status

### INTRODUCTION

In South Korea, the low birth rate is accelerating the aging of society, which is accompanied by an increase in the prevalence of various physical, psychological, and social problems related to the aging process. Geriatric depression is one of the most serious problems in South Korea [1]. Although existing studies have reported varying rates of the prevalence of geriatric depression in the country, a study investigating national panel data of aged individuals reported an overall prevalence rate of 19.9% among older adults aged 65 years or older. Broken down by sex, the rates were 16.2% among men and 23.5% among women [2].

Despite being so common, geriatric depression is often

underdiagnosed and undertreated [3]. Geriatric depression can lead to an increase in medical costs, have an overall negative effect on older adults' quality of life, and lead to increased physical symptoms and mortality [4]. In other words, depression in older adults is a significant health problem, and not a normal part of aging. Therefore, depression in this population requires appropriate study and intervention.

Numerous studies have examined the factors influencing both the symptoms and the physical, psychological, and economic outcomes of depression in older adults. The likelihood of experiencing geriatric depression has been shown to increase with age, and the disorder is more prevalent among women and those with low levels of educa-

**Corresponding author: Hwang, Eunhee** <https://orcid.org/0000-0002-6229-5946>

Department of Nursing, Wonkwang University, 460 Iksandae-ro, Iksan 54538, Korea.  
Tel: +82-63-850-6071, Fax: +82-63-850-6060, E-mail: ehh@wku.ac.kr

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tion [5,6]. Furthermore, depression appears to be worse among older adults with a poor ability to chew and those with a poor nutritional status [7,8]. The symptoms of geriatric depression tend to be aggravated among individuals with cognitive impairments [9].

The overuse of information technology by Korean adolescents and college students has had a negative impact on their mental health [10,11]. In contrast, among older adults, the use of information technology such as the internet or smartphones has a positive effect on mental health [12]. It is true that there are conflicting results such as the fact that the use of information technology does not affect depression [13]. However, in order to understand the effect of older adults' use of information technology and the policy based on it, it is necessary to identify the effect of its use on depression.

According to a survey on older adults in Korea, 70.9% of those over 65 years old have two or more chronic diseases [14]. People with multimorbidity have poorer functional status, quality of life, and health outcomes and higher health care costs than those without multimorbidity [15]. However, most of the studies on depression in older adults have been related to a single disease. As such, more information is needed to understand the relationship between multimorbidity and depression in older adults so as to develop interventions aimed at prevention and burden reduction, and to align health care services more appropriately.

Among Korean older adults aged 65 years and over, the prevalence of depression is 20.0% in those with more than

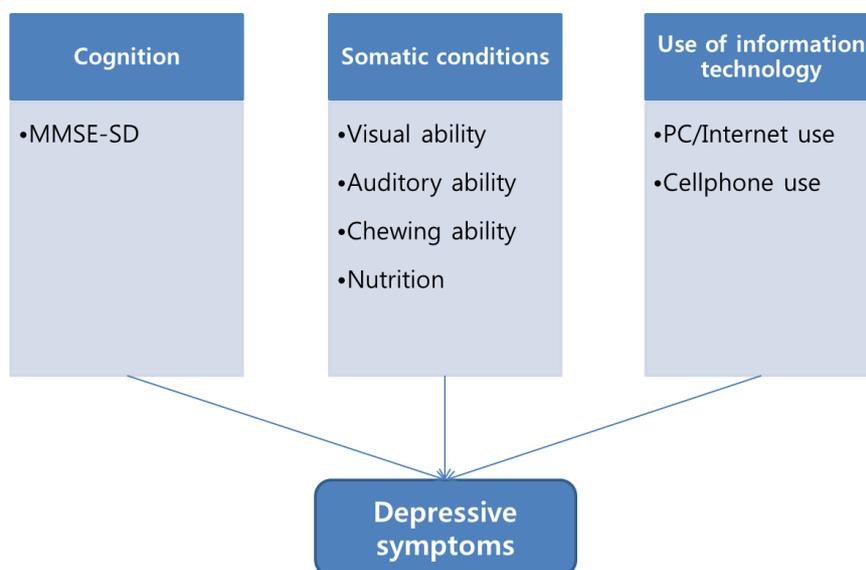
three chronic diseases, 17.3% in those with two chronic diseases, 15.5% in those with one chronic disease, and 9.9% in those without a chronic disease [16]. These findings indicate that older adults with multiple diseases might have a high incidence of depression. Depressive symptoms, which do not necessarily fulfill the diagnostic criteria for depression, have been identified as a significant factor associated with poor health outcomes. Screening for depressive symptoms is important for identifying significant risk factors [17]. Therefore, the present study examined the factors that influence depressive symptoms in older Korean adults with multiple chronic diseases.

Specifically, this study aimed to (1) compare differences in sociodemographic, cognitive, and body functional factors and the use of information technology between depressive and non-depressive groups of older adults with multiple chronic diseases and (2) determine the effects of cognitive function, nutritional management status, functional status, and the use of information technology on geriatric depressive symptoms.

## METHODS

### 1. Study Design and Data Source

This was a cross-sectional study involving secondary analysis of data from the 2014 National Survey on the Elderly to determine the factors related to depressive symptoms among older adults with multiple chronic diseases (Figure 1).



MMSE-DS=mini-mental state examination for dementia screening.

**Figure 1.** Study framework.

## 2. Study Participants

The inclusion criteria were: adults aged 65 years or older and dwelling in one of the 16 cities or provinces in which the 2014 survey was conducted [18]. The sample was selected using a proportional stratified sampling method. The population was first stratified according to the 16 cities and provinces, and the provinces were then further stratified by town. One-to-one direct interviews were conducted with household-dwelling participants over the age of 65. The survey results comprised the overall living conditions, familial and social relationships, economic status and activities, health conditions and behaviors, functional status, leisure activities, living environment, safety, use of facilities and services, and perceptions about old age.

Since depressive symptom screening was conducted using a self-reported questionnaire, we excluded older adults with dementia owing to concerns regarding the reliability of their responses. We also excluded older adults with depression because our focus was on the screening of undetected depressive symptoms. From among the 10,451 older adults (100% response rate) who participated in the survey, we focused on the 6,672 older adults who responded to the questionnaire themselves, did not have dementia or depression, and who had two or more chronic diseases that had been diagnosed by a doctor. The chronic diseases reported by the older adults included cardiovascular, endocrine, musculoskeletal, respiratory, sensory, digestive, genitourinary and other illnesses (e.g., anemia, sequela of fracture, and others), and cancer.

## 3. Measurements

### 1) Sociodemographic characteristics of participants

We selected sociodemographic variables through a literature review [2,5,6]. The sociodemographic characteristics investigated in this study were age, gender (men, women), educational level (uneducated, elementary, middle school, high school, college or more), marital status (unmarried, married, widowed, others), and employment status (employed, unemployed).

### 2) Depressive symptoms

Depressive symptoms were evaluated using the short form of the Geriatric Depression Scale (SGDS). This scale, developed by Sheikh and Yesavage [19], is a 15-item version of the original (30-item) Geriatric Depression Scale. Each of the 15-items on the SGDS is answered "yes" or "no," with the total score ranging from 0 to 15. Higher

scores indicate more severe depressive symptoms. A total score of 8 has been proposed as the cutoff for depression according to a diagnostic validity study in South Korea [20]. Therefore, we defined the presence of depressive symptoms as an SGDS score of 8~15. The reliability of the instrument was measured by means of Cronbach's  $\alpha$ , which was 0.895 in the present study.

### 3) Independent variables

The independent variables in this study were as follows. For cognitive function, we used the score on the Korean version of the Mini-Mental State Examination for dementia screening [21]. This 19-item tool is responded to using "yes" or "no" answers, with higher scores indicating better cognitive function. Nutritional management status was evaluated using the DETERMINE Your Nutrition Health Checklist developed by the Nutrition Screening Initiative [22]. On the nutrition checklist, the summed scores for the 10 items (0=yes; 1=no) can be classified as good nutritional management (0~2 points), moderate nutritional management risk (3~5 points), and high nutritional management risk (6 points or more). We also investigated the functional status for vision, hearing, and chewing (rated as "not difficult," "slightly difficult," and "very difficult") and online networking. Online networking was measured in terms of computer and internet use (rated as "very proficient," "without difficulty," "with difficulty," and "never use"), possession of a cellphone (rated as "smartphone," "general cellphone," and "no"), and purpose of cellphone use (rated as "only calling," "calling and receiving messages," "calling and sending messages," and "searching for information and more").

### 4) Ethical considerations

The National Survey on the Elderly is conducted by the Ministry of Health and Welfare every three years. The 2014 survey was approved by the National Statistical Office (Approval No. 11771). For our study, after receiving the approval of the Korean Institute for Health and Social Affairs, we received raw data without personal identification information and analyzed them statistically.

### 5) Statistical analysis

IBM SPSS Statistics 23.0 was used for all statistical analyses in this study. Descriptive statistics were computed for all variables, including the means and Standard Deviations (SD) for continuous variables, and frequencies and percentages for categorical variables. The differences between groups were examined using an independent t-test and  $\chi^2$  test. A logistic regression analysis was used to examine

the association of depressive symptoms with cognitive function, nutritional management status, online networking.

## RESULTS

### 1. Sociodemographic and Clinical Characteristics of Subjects

As shown in Table 1, 36.7% of the subjects had a score of 8 points or more on the SGDS. The mean age of respondents with depressive symptoms was  $75.21 \pm 6.49$  years and 68.5% of them were women. Of those with depressive symptoms, 45.3% had zero years of formal education, 48.4% were married, and 17.8% were employed. The mean period of education was  $4.78 \pm 4.49$  years and the average number of chronic diseases was  $3.69 \pm 1.59$ . The mean score for cognition was  $22.23 \pm 5.03$  points and 35.7% were classified as having "high nutritional management risk." The average SGDS score was  $11.08 \pm 2.12$  points.

The mean age of the respondents without depressive symptoms was  $73.45 \pm 6.23$  years and 59.6% of them were women. Of those with depressive symptoms, 26.5% had no formal education, 63.6% were married, and 31.0% were employed. The mean period of education was  $6.96 \pm 4.83$  years and the average number of chronic diseases was  $3.11 \pm 1.25$ . The mean score for cognition was  $24.29 \pm 4.35$  points and 12.6% were classified as having "high nutritional management risk." The average SGDS score was  $2.90 \pm 2.28$  points (Table 1).

### 2. Differences in Characteristics between the Depressed and Non-depressed Groups

We found that the depressed group was older, had a larger proportion of women, had lower educational levels, had fewer married and employed individuals, had poorer cognitive function, was more likely to have high nutritional management risk, and had higher SGDS scores than did the non-depressed group (Table 1). Furthermore, the depressed group was more likely to have functional limitations (e.g., vision, hearing, and chewing) and was less likely to use computers or cellphones (Table 2).

### 3. Influencing Factors of Depressive Symptoms

The results of the logistic regression analysis indicated that the significant predictors of depressive symptoms were unemployment (Odds Ratio [OR]=1.85, 95% Confidence Interval [CI]=1.59~2.15), high nutritional management risk (OR=1.19, 95% CI=1.16~1.22), slight visual dysfunction

(OR=1.21, 95% CI=1.05~1.38), high visual dysfunction (OR=1.41, 95% CI=1.04~1.91), slight hearing dysfunction (OR=1.22, 95% CI=1.05~1.43), slight chewing dysfunction (OR=1.37, 95% CI=1.19~1.59), high chewing dysfunction (OR=1.59, 95% CI=1.30~1.95), low degree of cellphone utilization (OR=1.60, 95% CI=1.04~2.46), older age (OR=0.99, 95% CI=0.98~1.00), and higher education (OR=0.96, 95% CI=0.95~0.98). Please see Table 3 for more information.

## DISCUSSION

We identified factors related to depressive symptoms in older Korean adults. Furthermore, since we used a nationally representative sample, the results of this study are generalizable to older adults throughout South Korea.

We found that 36.7% of the respondents showed depressive symptoms. This prevalence rate was higher than that of the findings in previous studies on older adults [5,7,23]. Furthermore, the prevalence rate of depressive symptoms in our study was substantially higher than in another study on Korean adults over 65 years with chronic disease, where it was 20.0% among those with three or more chronic diseases, followed by 17.3% in those with two chronic diseases [16]. The higher rate of depressive symptoms in this study is presumed to be due to the difference in criteria for judging the presence or absence of depressive symptoms. We used the SDGS as the screening tool while the precedent study [16] screened positive for depressive symptoms when respondents said they had been sad or desperate for more than two consecutive weeks for the past year. This may be because the formal screening of depressive symptoms is superior to retrospective judgment by older adults. Research on geriatric depression has shown that the number of diseases has a positive causal relationship with depression [24], which suggests a need for a greater focus on older adults with multiple chronic medical conditions since they may be more susceptible.

We identified a number of important factors that have an impact on depressive symptoms, such as physical health status and unemployment. Employment status [2,25] and body functioning were related to depression [26] and this was consistent with past research. Evidently, health programs to maintain healthy body function and policies to encourage the employment of older adults are needed to prevent depressive symptoms.

Older adults tend to be at a high risk of having an inadequate diet and being malnourished, which can lead to diminished functional status, muscle damage, a dysfunctional immune system, anemia, diminished cognitive function, delayed wound healing, high hospitaliza-

**Table 1.** Differences of Socio-demographics and Clinical Characteristics between Depressed Group and Non-depressed Group

Variables	Categories	Depressed group	Non-depressed group	P	
		(n=2,446, 36.7%) n (%) or M±SD	(n=4,226, 63.3%) n (%) or M±SD		
Socio-demographics	Age (year)	75.21±6.49	73.45±6.23	< .001	
	Gender	Men	767 (31.5)	1,707 (40.4)	< .001
		Women	1,673 (68.5)	2,518 (59.6)	
		Missing	6	1	
	Education (year)		4.78±4.49	6.96±4.83	< .001
		Uneducated (illiteracy)	409 (16.8)	290 (6.9)	< .001
		Uneducated (literacy)	695 (28.5)	829 (19.6)	
		Elementary	775 (31.8)	1,438 (34.0)	
		Middle school	245 (10.0)	572 (13.5)	
		High school	242 (9.9)	737 (17.5)	
		College or more	74 (3.0)	358 (8.5)	
		Missing	6	2	
	Marital status	Unmarried	17 (0.7)	12 (0.3)	< .001
		Married (with partner)	1,180 (48.4)	2,686 (63.6)	
		Widowed	1,125 (46.1)	1,373 (32.5)	
Others (divorce or bereavement)		118 (4.8)	153 (3.6)		
Missing		6	2		
Employment	Employed	435 (17.8)	1,308 (31.0)	< .001	
	Unemployed	2,005 (82.2)	2,917 (69.0)		
	Missing	6	1		
Chronic disease	Number of chronic disease	3.69±1.59	3.11±1.25	< .001	
	Type of chronic disease	Hypertension	1,729 (70.7)	3,056 (72.3)	.303
		Stroke	290 (11.9)	321 (7.6)	< .001
		Hyperlipidemia	621 (25.4)	1,222 (28.9)	.002
		Angina/Myocardial infarction	256 (10.5)	353 (8.4)	.004
		Diabetes Mellitus	836 (34.2)	1,225 (29.0)	< .001
		Thyroid disease	103 (4.2)	167 (4.0)	.484
		Arthritis	1,249 (51.1)	1,690 (40.0)	< .001
		Osteoporosis	555 (22.7)	684 (16.2)	< .001
		Chronic obstructive pulmonary disease	79 (3.2)	70 (1.7)	< .001
		Asthma	108 (4.4)	137 (3.2)	.028
		Cataract	330 (13.5)	446 (10.6)	.001
		Renal failure	48 (2.0)	60 (1.4)	.043
		Benign prostatic hyperplasia	263 (10.7)	449 (10.6)	.587
		Urinary Incontinence	100 (4.1)	97 (2.3)	< .001
Cognition	MMSE-DS	22.23±5.03	24.29±4.35	< .001	
Nutrition	NSI		4.73±3.28	2.74±2.42	< .001
		Good	708 (28.9)	2,283 (54.0)	
		Moderate	867 (35.4)	1,411 (33.4)	
		Bad	871 (35.7)	532 (12.6)	
Depression	SGDS	11.08±2.12	2.90±2.28	< .001	

MMSE-DS=mini-mental state examination for dementia screening; NSI=nutritional screening initiative; SGDS=short form of the geriatric depression scale; SD=standard deviation.

**Table 2.** Differences of Functional Status and the Use of Information Technology between Depressed Group and Non-depressed Group

Variables	Categories	Depressed group	Non-depressed group	<i>p</i>	
		(n=2,446, 36.7%)	(n=4,226, 63.3%)		
		n (%)	n (%)		
Functional status	Visual	No difficulty	1,137 (46.5)	2,678 (63.4)	< .001
		Slight difficult	1,093 (44.7)	1,388 (32.9)	
		Very difficult	216 (8.8)	158 (3.7)	
		Missing		1	
	Auditory	No difficulty	1,580 (64.6)	3,316 (78.5)	< .001
		Slight difficult	717 (29.3)	777 (18.4)	
		Very difficult	149 (6.1)	133 (3.1)	
		Missing		1	
	Chewing	No difficulty	652 (26.6)	2,111 (49.9)	< .001
		Slight difficult	1,195 (48.9)	1,630 (38.6)	
		Very difficult	599 (24.5)	484 (11.5)	
		Missing		1	
Use of information technology	Using computer and internet	Very proficient	14 (0.6)	130 (3.1)	< .001
		Without difficulty	50 (2.0)	328 (7.8)	
		With difficulty	85 (3.5)	331 (7.8)	
		Never use	2,298 (93.9)	3,436 (81.3)	
	Purpose of cellphone use	Only calling	1,329 (75.0)	2,035 (57.5)	< .001
		Calling & receiving message	288 (16.3)	709 (20.0)	
		Calling & sending message	113 (6.4)	495 (14.0)	
		Searching information or more	42 (2.4)	300 (8.5)	

tion/re-hospitalization rates, and mortality [27]. Thus, nutrition is an important factor to consider in the health management of older adults. In this vein, previous studies have demonstrated a significant relationship between malnutrition and depression [5]. Indeed, the inadequate nutritional pattern of older adults appears to have an influence on both physical and mental health including depression [28]. In the present study, we investigated the relationship between nutritional management status (rather than nutritional status) and depressive symptoms and found that 35.7% of the respondents with and 12.6% of those without depressive symptoms were at a high nutritional management risk. The difference between the two groups was significant. Older adults, especially those with depressive symptoms, are vulnerable to poor nutritional management. Therefore, timely screening of older adults at risk of poor nutritional status is vital to manage depressive symptoms.

We found that dysfunctions in vision, hearing, and chewing were significantly related to depressive symptoms. Sensory disorders are typically accompanied by numerous difficulties in activities of daily living, and several studies have found vision and hearing dysfunctions to be asso-

ciated with geriatric depression [7,23]. Past studies have also found that chewing dysfunction is related to depression [8], which is consistent with the findings of the current study.

The purpose of cellphone use among Korean older adults also influenced the odds of exhibiting depressive symptoms. Smartphones can be an effective method to improve and maintain cognitive function and decrease depression in older adults aged 65 years or older [29]. Additionally, it has been shown that information technology and online social interaction can be used to influence geriatric depression directly [30]. This study suggests that online networking as a form of social support can be utilized as an intervention for geriatric depression. In other words, it may be beneficial to implement educational programs on smartphone usage for older adults at libraries and community centers. South Korea has the highest penetration rate of high-speed internet worldwide, and as such, smartphone technology could be used to improve older adults' psychological well-being.

Cognitive function was not identified as an influencing factor in the present study. Although one study reported no correlations between cognitive function and depres-

**Table 3.** Associated Factors with Depressive Symptoms as the Dependent Variable using Logistic Regression Model

Variables	B	SE	p	OR	95% CI	
Age, year	-0.013	0.006	.046	0.99	0.98~1.00	
Gender (reference=men)	-0.023	0.071	.742	0.98	0.85~1.12	
Education, year	-0.039	0.009	<.001	0.96	0.95~0.98	
Employment status (reference=employed)	0.613	0.076	<.001	1.85	1.59~2.15	
Cognition	-0.012	0.009	.191	0.99	0.97~1.01	
NSI	0.175	0.012	<.001	1.19	1.16~1.22	
Functional status	Visual (reference=No difficulty)					
	Slight difficult	0.185	0.068	.007	1.21	1.05~1.38
	Very difficult	0.344	0.153	.025	1.41	1.04~1.91
	Hearing (reference=No difficulty)					
	Slight difficult	0.198	0.079	.007	1.22	1.05~1.42
	Very difficult	0.320	0.178	.072	1.38	0.97~1.95
	Chewing (reference=No difficulty)					
	Slight difficult	0.318	0.074	<.001	1.37	1.19~1.59
	Very difficult	0.464	0.105	<.001	1.59	1.30~1.95
	Use of information technology	Computer or Internet (reference=Very proficient)				
Without difficulty		0.112	0.340	.741	1.12	0.57~2.11
With difficulty		0.318	0.340	.349	1.37	0.76~2.02
Never use		0.629	0.331	.057	1.88	1.00~3.51
Cellphone (reference=Searching information or more)						
Only calling		0.471	0.219	.032	1.60	1.04~2.46
Calling & receiving message		0.350	0.220	.112	1.42	0.92~2.19
Calling & sending message		0.134	0.223	.547	1.14	0.74~1.77

NSI=nutritional screening initiative; SE=standard error; OR=odds ratio; CI=confidential interval.

sion in Korean older adults [29], most previous studies suggested the existence of a correlation between these two variables [8]. Cognitive decline is regarded as a continuous process from normal function to dementia. Therefore, cognitive decline-related and comorbid disease characteristics will differ depending on the degree of cognitive decline. However, we only analyzed the cognitive function score in a dichotomous manner (i.e., as normal or abnormal). Therefore, we could not identify possible influential factors. Further studies need to consider the relationship and direction of these variables through longitudinal studies.

The present study had several limitations. First, we applied a subjective self-report measurement method to assess geriatric depressive symptoms. Thus, the prevalence of depressive symptoms may have been under or overestimated, depending on the situation. However, we made sure to use evaluation tools with robust validity to limit this possibility. Second, although we considered a

number of different types of factors related to geriatric depression, we did not consider the possible interactions between two or more types of factors. Third, although the present study selected a representative sample of the Korean older adult population, we could not analyze any causal relationships between depressive symptoms and other factors because this was a cross-sectional survey.

## CONCLUSION

We identified that unemployment, poor nutritional management status, visual dysfunction, moderate hearing dysfunction, chewing dysfunction, and infrequent cellphone use were significant factors associated with depressive symptoms among Korean older adults. Those at a higher age or educational level report fewer depressive symptoms.

Our results suggest that interventions targeting geriatric depression in South Korea must begin with the active

utilization of assistive devices aimed at enhancing older adults' physical functions, such as sight, hearing, and chewing. Additionally, nutritional management policies that seek to improve nutritional status could be developed along with nutrition education programs. The use of the internet and smartphones could be promoted through the development or utilization of applications customized for older adults.

### CONFLICTS OF INTEREST

The authors declared no conflict of interest.

### AUTHORSHIP

Study conception and writing draft - HE; Data analysis and interpretation - SS.

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