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RESEARCH ARTICLE

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Impact of functional level on cognitive function in adults aged 45 and older than 45 years in the Korean Longitudinal Study of Aging

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Abstract

Objective: This study aimed to analyse the potential factors affecting cognitive function, focusing on the functional level, by utilising longitudinal data from adults aged 45 years and older.

Methods: This was a secondary data analysis using data from the Korean Longitudinal Study of Aging (KLoSA) covering multiple waves of the survey. Cognitive function was measured using the Korean mini-mental state examination (K-MMSE), and activities of daily living (ADL), instrumental activities of daily living (IADL), diseases, hearing and visual impairments, and depression were included as independent variables. A fixed-effects model was used to assess the influence of independent variables on cognitive function over time.

Results: Cognitive function, as measured using the K-MMSE, declined significantly, with the proportion of participants with normal cognition decreasing from 76% in the first wave to 68% in the eighth wave. Cognitive impairment and suspected dementia cases increased over time, and the average K-MMSE score dropped from 25.44 ± 5.31 to 24.71 ± 5.56. Panel regression analysis showed that impairments in ADL ($b = -.44$, $p < .001$) and IADL ($b = -.64$, $p < .001$), depression, and hearing and visual impairments were significantly associated with lower cognitive function. In addition, hypertension, cancer, heart disease, cerebrovascular accidents, psychiatric diseases and arthritis were significantly associated with cognitive decline. After adjusting for these factors, cognitive function still decreased significantly over time, explaining 75% of the variance in K-MMSE scores ($R^2 = .75$).

Conclusions: This study confirmed that IADL and ADL predict cognitive impairment, with IADL limitation significantly contributing to cognitive decline in the study participants. Evaluating IADL, ADL, and other chronic health conditions in adults aged 45 and older can help identify individuals at risk for cognitive impairment.

KEYWORDS

activities of daily living, aged, cognition, comorbidities, quality of life

1 | INTRODUCTION

The older adult population in South Korea is projected to increase rapidly, reaching 20% of the general population in 2025 and exceeding 40% by 2050, compared to 16% in 2020.[1] This rapid population ageing presents significant challenges, particularly due to its impact on health systems and individual well-being. Functional declines and chronic conditions prevalent in older adults are closely tied to cognitive impairment, a critical issue requiring urgent attention. Older adults experience a decline in functional level and often live with chronic conditions such as hypertension, diabetes, dementia, stroke and arthritis. The multiple medications used to treat such complex diseases may accelerate cognitive impairment and cause geriatric syndromes, such as falls, insomnia and loss of appetite.[2] In addition to chronic conditions, hearing and visual impairments, and depression can serve as causes of functional impairments in daily life.[2] People with limitations in basic activities of daily living (ADL) or instrumental activities of daily living (IADL) account for 6% and 12% of older adults receiving home care, respectively.[3] The proportion of older adults capable of performing ADL independently has increased slightly compared with a 2017 survey in Korea.[3] However, the percentage of older adults requiring assistance in daily life remains relatively high.

Cognitive function and ADL are closely related to the quality of life in older adults. Loss of cognitive function and ADL due to memory loss, low cognitive processing speed and limited autonomy can lead to impaired social interaction and quality of life in older adults.[4,5] Activities of daily living and IADL not only represent an individual's ability to live independently but also act as important indicators of overall well-being.[6,7] Conversely, ADL and IADL are associated with physical activity and function and therefore act as crucial factors in preventing cognitive decline in older adults.[8]

In addition to ADL and IADL, several other factors influence cognitive function, including physical and mental health conditions (e.g. depression), overall health status and hearing and visual impairments.[9,10] For example, the co-existence of cerebrovascular disease and depression has been identified as a significant contributor to cognitive impairment, highlighting the need for comprehensive management strategies.[11]

Previous studies on the relationship between cognitive function and ADL have primarily focused on examining changes in ADL associated with cognitive function. Despite the importance of longitudinal studies in understanding the impact of cognitive function on ADL over time, most previous studies were cross-sectional in nature, making the examination of temporal changes challenging.[8,12] In the context of preventing impairments in ADL and IADL and improving or maintaining cognitive function in adults aged 45 years and older, existing research has mostly focused on older adults, making it difficult to gather evidence for preventive interventions in a broader sense. In this study, we aimed to utilise longitudinal data encompassing adults aged 45 years and older to examine the potential factors influencing cognitive function, including ADL and IADL. Thus, we sought to provide foundational evidence for interventions to enhance the quality of life in older adults.

Practice impact

This study provides valuable insights, highlighting that activities of daily living (ADL), instrumental activities of daily living (IADL), and comorbidities such as visual or hearing impairments, cancer, neurological or mental disorders, and arthritis are significant predictors of cognitive function in adults aged 45 and older over time.

2 | METHODS

2.1 | Study design

This was a secondary data analysis using data from the first to eighth waves of the Korean Longitudinal Study of Aging (KLoSA). The KLoSA is a biennial nationally representative panel survey conducted using computer-assisted personal interviews. The original sample consisted of 10,254 people aged 45 years or older (born before 1961) nationwide residing in 15 major administrative regions, excluding Jeju Island, South Korea, in 2006. Participants were randomly selected through a multistage stratified sampling process, where survey districts were organised by region and residential type according to administrative codes.

Age 45 marks a transitional period into old age, characterised by physical and social changes.[13,14] The KLoSA surveys individuals aged 45 years and older to provide data on the ageing population's health and socio-economic status. This study included participants aged 45 years and older to examine the factors influencing changes in cognitive function over time without dividing participants into specific age groups.

The KLoSA survey includes various aspects of the economic and social activities of participants aged 45 years and older, including demographics, family, health, employment, income, assets and subjective expectations. The first wave in 2006 included 10,254 participants, and subsequent waves had varying retention rates: 85% in 2008, 77% in 2010 and 73% in 2012. To address attrition, 920 new

participants were added to the fifth wave in 2014, resulting in 7949 respondents. By the eighth wave in 2020, the panel included 6488 participants, with a 77% retention rate from the original cohort.

To address missing data across the eight waves, participants who provided responses for at least one wave were included in the analysis. This approach maximised the use of available data while maintaining the representativeness of the sample, including older adults with varying health and functional levels. For critical variables, such as the Korean Mini-Mental State Examination (K-MMSE), ADL and IADL, only cases with complete data for these variables at each wave were included to ensure the validity of the statistical models. This strategy minimised potential biases associated with imputing values for cognitive and functional measures, which are highly sensitive to ageing and health conditions.

Due to the longitudinal nature of the data, not all participants completed every wave of the survey. Attrition occurred because of mortality, non-response and dropout, which are common challenges in long-term panel studies. The results of an attrition analysis indicated that attrition was primarily due to mortality and age-related factors, reflecting real-world patterns in ageing populations.

To address variations in the number of observations per participant, fixed-effects panel regression models, which are robust with unbalanced data, were employed. These models focused on within-individual changes over time, allowing for a nuanced understanding of how cognitive and functional health evolved in the study population. These measures ensured that the study findings remained robust and reflective of real-world ageing trajectories, even in the presence of missing data. Detailed information about the survey can be accessed on the panel survey organisation website (https://survey.keis.or.kr/eng/klosa/klosa01.jsp).[15]

2.2 | Measurements

The variables used for analysis in this study were as follows:

2.2.1 | Independent variables

The ADL and IADL were analysed based on the questions of the KLoSA regarding the performance of daily activities. The ADL evaluates the ability to perform basic daily activities such as changing clothes, washing face/brushing teeth/washing hair, bathing/showering, eating, going out of the room, using the restroom and continence. Activities are measured based on the requirement of human assistance. The IADL evaluates the ability to perform instrumental daily activities. This is measured by whether one needs help from others to groom oneself, do household chores, prepare meals, do laundry, go out for short distances, use transportation, make purchases, manage money, make and receive phone calls or take medications. For each question, a score of 1 was given when assistance was partially or completely required for the performance of an activity, and a score of 0 was given when no assistance was required. The total score serves as a numerical indicator, ranging between 0 and 7 for ADL and between 0 and 10 for IADL, with higher scores indicating lower independence in daily activities.[16]

The diseases assessed included hypertension, diabetes, cancer, respiratory disease, liver disease, heart disease, cerebrovascular disease, mental disorders and arthritis. Disease presence was determined by asking, 'Have you ever been diagnosed with a specific disease by a doctor?' If the participant had been diagnosed with the disease, it was categorised as 'present'. If not, it was categorised as 'absent'.

The presence of hearing and vision impairments was determined by asking the question, 'Do you have visual or hearing impairment?' If the participant answered yes to having visual or hearing impairment, it was categorised as 'present'. If not, it was categorised as 'absent'.

We assessed whether the participants had experienced persistent depression for two or more weeks in the past year and their antidepressant use. Additionally, we used the Center for Epidemiologic Studies Depression Scale, a tool widely used for measuring depressive symptoms in epidemiological research.

General characteristics included sex, age, educational level and marital status. Sex was classified as male or female. Education was categorised as middle school or less or high school and above. Age was classified into 45–64, 65–74, 75–84 and ≥85 years. The aim of this study was to examine the factors influencing longitudinal changes in cognitive function among adults aged 45 years and older. Accordingly, we did not distinguish between or compare the age groups separately. Marital status was divided into single and married for the analysis.

2.2.2 | Dependent variable (cognitive function)

Cognitive function was assessed using the K-MMSE, which was translated from Folstein et al.'s original MMSE[17] and validated by Kang et al.[18] The K-MMSE tailored certain language-based tasks or items to the Korean population and excluded 'Alternatively spell "world" backward' in the attention and calculation domain of

the MMSE. The K-MMSE consists of 19 questions and is identical in content to the MMSE, which consists of 11 questions.[17,18] The MMSE consists of 30 points allocated as follows: orientation (10 points), registration (3 points), attention and calculation (5 points), recall (3 points) and language (9 points). The K-MMSE is the same, except that the language areas of the MMSE are divided into language (8 points) and visual composition (1 point). The validity and reliability of the K-MMSE have been demonstrated in previous studies.[18] A higher cognitive function score indicates better cognitive abilities. The total score ranges from 0 to 30, with scores <17 indicating possible dementia, scores 18–23 indicating cognitive impairment, and scores ≥ 24 considered normal.[17]

2.3 | Statistical analysis

The data for this study were collected from a longitudinal dataset that selected samples from 2006 and followed up on the same individuals every 2 years until 2020. We examined the effects of changes in disease, hearing and vision, depression, and ADL and IADL on cognitive function over time. Time points from the first to eighth wave were set as variables labelled as 'Time' and included in the analysis. Using a fixed effects model, we analyzed the relationship between changes in independent variables (based on the difference in time points for the same individual) and changes in dependent variables. The distribution of the participants' general characteristics is presented for each time point because of the varying sample sizes at each time point in Tables 1 and 2. Descriptive statistical analyses were performed for ADL, IADL and K-MMSE scores at each time point.

2.4 | Ethics approval

This study was exempted from review by the Institutional Review Board (IRB) of Jeju National University (IRB no. JJNU-IRB-2023-017).

3 | RESULTS

3.1 | General characteristics of participants

Table 1 summarises the general characteristics of the participants across survey waves. The proportion of female participants increased from 56% in the first to 59% in the eighth wave. The proportion of participants with a high school diploma or higher increased from 37% to 41%. There was a shift in age distribution, with participants aged 45–64 years decreasing from 60% to 24%, while those aged >65 years increased. Marital status declined from 78% to 73%.

3.2 | ADL, IADL and other chronic health conditions

Tables 1 and 2 present the ADL, IADL scores and other chronic health conditions of the study participants. The prevalence of chronic conditions increased over time. Hypertension increased from 28% in the first wave to 50% in the eighth, whereas diabetes nearly doubled from 12% to 23%. Cancer prevalence also steadily increased from 2% to 8%. The prevalence of heart disease increased from 5% in the first to 11% in the eighth wave. The prevalence of mental disorders was 2% and 5% in the first and eighth waves, respectively. The prevalence of arthritis was 16% and 29% in the first and eighth waves, respectively. In contrast, visual and hearing impairments showed fluctuating trends, with visual impairment decreasing from 8% to 3% and hearing problems initially declining and then rising again by the eighth wave. Depression scores saw a modest upward trend, increasing from 16.0 ± 5.0 in the first wave to 18.0 ± 4.2 by the eighth.

Scores for ADL remained largely stable, with a slight rise from $.12 \pm .77$ to $.14 \pm .85$, and IADL scores showed a minor increase from $.49 \pm 1.62$ to $.57 \pm 1.91$, indicating a gradual decline in participants' ability to perform more complex daily activities.

3.3 | Cognitive function

Participants' cognitive function levels are presented in Tables 1 and 2. In the normal group, based on the K-MMSE results, the percentage was 76% in the first wave, which gradually decreased to 68% in the eighth wave. The number of suspected dementia cases increased from 9% in the first wave to 11% in the eighth wave, whereas the number of cases of cognitive impairment increased from 16% in the first wave to 21% in the eighth wave. The average cognitive function score was 25.44 ± 5.31 in the first wave and 24.71 ± 5.56 in the eighth wave, indicating a gradual decline over time.

3.4 | Impact of IADL, ADL and other chronic health conditions on cognitive function

Table 3 presents the regression coefficients from the analysis examining the factors influencing cognitive function,

TABLE 1 General characteristics, health problems and cognitive functions across the survey waves.

	%									
Variables	**Wave1 (*n* = 9948)**	**Wave2 (*n* = 8309)**	**Wave3 (*n* = 7422)**	**Wave4 (*n* = 7038)**	**Wave5 (*n* = 6613)**	**Wave6 (*n* = 6245)**	**Wave7 (*n* = 5763)**	**Wave8 (*n* = 5379)**	χ^2	***p***
Gender										
Male	44	43	43	43	42	42	42	41	14.8508	.04
Female	56	57	57	57	58	58	58	59		
Education										
Under middle school	63	64	64	63	62	61	61	59	49.6758	<.001
Over high school	37	36	36	37	38	39	39	41		
Age group										
45–64 years	60	54	50	45	40	35	30	24	3666.646	<.001
65–74 years	26	29	30	31	32	32	33	36		
75–84 years	12	14	17	20	23	25	28	30		
Over 85 years	2	3	4	4	5	7	8	10		
Marital status										
Single	22	22	23	24	24	25	26	27	94.7083	<.001
Married	78	78	77	76	76	75	74	73		
Eyesight problem										
No	92	94	96	96	96	97	96	97	352.3982	<.001
Yes	8	6	4	4	4	3	4	3		
Hearing problem										
No	96	98	98	98	98	98	97	97	110.5224	<.001
Yes	4	2	2	2	2	2	3	3		
Hypertension										
No	72	68	63	60	57	54	52	50	1332.094	<.001
Yes	28	32	37	40	43	46	48	50		
DM										
No	88	86	84	83	81	80	79	77	517.1295	<.001
Yes	12	14	16	17	19	20	21	23		
Cancer										
No	98	97	96	95	94	93	93	92	434.1645	<.001
Yes	2	3	4	5	6	7	7	8		

(Continues)

TABLE 1 (Continued)

Variables	% Wave1 (n = 9948)	Wave2 (n = 8309)	Wave3 (n = 7422)	Wave4 (n = 7038)	Wave5 (n = 6613)	Wave6 (n = 6245)	Wave7 (n = 5763)	Wave8 (n = 5379)	χ^2	p
Lung disease										
No	98	97	97	97	97	97	97	97	35.5104	<.001
Yes	2	3	3	3	3	3	3	3		
Liver disease										
No	98	98	97	97	97	97	97	97	99.7609	<.001
Yes	2	2	3	3	3	3	3	3		
Heart disease										
No	95	94	93	92	91	90	90	89	326.1618	<.001
Yes	5	6	7	8	9	10	10	11		
CVA										
No	97	96	96	95	95	94	94	93	204.143	<.001
Yes	3	4	4	5	5	6	6	7		
Psychiatric disease										
No	98	98	97	96	96	95	95	95	244.8302	<.001
Yes	2	3	3	4	4	5	5	5		
Arthritis										
No	84	80	77	75	74	72	72	72	548.1047	<.001
Yes	16	20	23	25	26	28	28	29		
Cognitive function										
Dementia suspected (≤17)	9	9	10	9	10	10	11	11	148.2643	<.001
(K-MMSE score)										
Cognitive function declined (18–23)	15	17	17	16	18	18	20	21		
Normal (≥24)	76	73	73	74	72	72	69	68		

Note: Data are presented as percentages (%). *p*-Values indicate χ^2 test results that compare distributions across the eight survey waves.

Abbreviations: CVA, Cerebrovascular accident; DM, Diabetes mellitus.

TABLE 2 Descriptive statistics for depression, ADL, IADL and K-MMSE scores.

	Wave 1 ($n=9948$)		Wave 2 ($n=8309$)		Wave 3 ($n=7422$)		Wave 4 ($n=7038$)		Wave 5 ($n=6613$)		Wave 6 ($n=6245$)		Wave 7 ($n=5763$)		Wave 8 ($n=5379$)	
	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD	M	SD
Age (years)	61.6	11.0	63.5	10.8	65.1	10.4	66.7	10.1	68.1	9.8	69.6	9.5	71.0	9.2	72.4	8.9
Depression	16.0	5.0	18.0	5.0	17.6	5.1	17.2	5.1	17.9	4.8	17.7	4.5	17.9	4.5	18.0	4.2
ADL	.1	.8	.1	.8	.1	.9	.1	.9	.1	.9	.2	.9	.2	.9	.1	.8
IADL	.5	1.6	.5	1.7	.5	1.7	.5	1.7	.5	1.8	.6	1.9	.5	1.8	.6	1.9
MMSE	25.4	5.3	25.2	5.3	25.1	5.5	25.3	5.5	25.1	5.6	25.1	5.5	24.8	5.8	24.7	5.6

Abbreviations: ADL, Activities of daily living; IADL, Instrumental activities of daily living; K-MMSE, Korean mini-mental state examination; M, Mean; SD, Standard deviation.

TABLE 3 Regression coefficients with K-MMSE.

			95% Confidence interval			
Variables	**b**	**SE**	**Lower**	**Upper**	***t***	***p***
Time	−.17	.01	−.19	−.16	−20.87	<.001
Depression	−.03	.004	−.04	−.02	−6.78	<.001
ADL	−.44	.04	−.51	−.37	−12.38	<.001
IADL	−.64	.02	−.68	−.61	−35.96	<.001
Eyesight problem	−.44	.10	−.62	−.26	−4.59	<.001
Hearing problem	−.50	.13	−.76	−.25	−3.78	<.001
Hypertension	−.20	.08	−.35	−.05	−2.57	.01
DM	−.05	.10	−.25	.13	−.55	.58
Cancer	−.52	.13	−.78	−.26	−3.85	<.001
Lung disease	.51	.31	−.09	1.10	1.67	.09
Liver disease	−.24	.20	−.62	.13	−1.22	.22
Heart disease	−.42	.13	−.68	−.16	−3.11	.002
CVA	−1.29	.16	−1.60	−1.00	−8.29	<.001
Psychiatric disease	−.97	.19	−1.34	−.61	−5.13	<.001
Arthritis	−.46	.11	−.68	−.25	−4.12	<.001
Gender	−.28	.52	−1.30	.72	−.53	.60

Note: $F=12.64$, $p<.001$, R-square = .75.

Abbreviations: ADL, Activities of daily living; CVA, Cerebrovascular accident; DM, Diabetes mellitus; IADL, Instrumental activities of daily living; K-MMSE, Korean mini-mental state examination; SE, Standard error.

measured by the K-MMSE using data from the first to eighth waves of the KLoSA. The analysis incorporated a time variable to account for changes over time and various independent variables, including ADL, IADL, presence of specific diseases (hypertension, diabetes mellitus, cancer, cerebrovascular accidents, and lung, liver, heart disease and depression), hearing and visual impairments and sex. Time was significantly associated with a decline in K-MMSE scores (b = −.17, 95% confidence interval [CI] −.19 to −.16, $p<.001$), indicating that cognitive function decreased over time. Both ADL (b = −.44, 95% CI −.51 to −.37, $p<.001$) and IADL (b = −.64, 95% CI −.68 to −.61, $p<.001$) impairments were strongly associated with lower cognitive function. Higher depression scores were associated with lower K-MMSE scores (b = −.03, 95% CI −.04 to −.02, $p<.001$), indicating that depression had a negative impact on cognitive function. Visual problems (b = −.44, 95% CI −.62 to −.26, $p<.001$) and hearing problems (b = −.50, 95% CI −.76 to −.25, $p=<.001$) were also significantly related to lower K-MMSE scores. Hypertension (b = −.20, 95% CI −.35 to −.05, $p=.01$), cancer (b = −.52, 95% CI −.78 to −.26, $p<.001$), heart disease (b = −.42, 95% CI −.68 to −.16, $p=.002$), cerebrovascular accidents (CVA) (b = −1.29, 95% CI −1.60 to −1.00, $p<.001$), psychiatric

disease (b = −.97, 95% CI −1.34 to −.61, $p < .001$) and arthritis (b = −.46, 95% CI −1.30 to −.72, $p < .001$) were all significantly associated with a decline in cognitive function. Sex, diabetes, lung and liver disease were not significantly associated with cognitive function. The model's F statistic was 12.64 ($p < .001$), and the R-square value was .75, indicating that 75% of the variance in cognitive function was explained by the model.

4 | DISCUSSION

In this study, we examined the impact of functional levels, measured using ADL and IADL, and chronic health conditions on cognitive function measured using the K-MMSE in adults aged 45 years and older. The results showed that IADL had the greatest influence on cognitive function in both age groups. A study of older adults in Brazil reported that individuals with moderate IADL impairment were approximately four times more likely to have cognitive impairment,[19] suggesting that IADL impairment may predict cognitive impairment, particularly in older adults. Continuous evaluation of IADL can prevent functional and cognitive decline over time. In this study, even after adjusting for changes in cognitive function, IADL remained significantly associated with cognitive impairment among adults aged 45 years and older, which is consistent with other research.[20]

Fieo et al suggested that cognitive decline occurs more rapidly when IADL is limited.[21] Maintaining good IADL functioning supports cognitive health and can help prevent cognitive decline; thus, IADL is a useful indicator for the early detection of cognitive decline and a target for interventions in adults aged 45 years and older. The association between arthritis, often linked to mobility in older adults, and cognitive impairment was supported by our findings and other studies.[22,23] Although the mechanisms remain unclear, brain inflammation may play a role.[22]

The co-existence of cerebrovascular disease and depression was a key contributor to cognitive impairment, aligning with previous findings. Intracranial atherosclerotic disease has been linked to cognitive impairment and neurodegeneration, suggesting its role in Alzheimer's disease progression.[24] Depression affects various cognitive domains[10] and significantly impacts social functioning and daily routines, acting as both a cause and consequence of depressive symptoms, with each factor potentially exacerbating the other over time, as shown by the bidirectional relationship between depressive symptoms and functional disability in older adults.[25] A longitudinal study in Mexico found that individuals with a history of depression had reduced memory and linguistic fluency even 3 years after recovery,[26] highlighting the lasting impact of late-middle-age depression on later-life cognition. These findings emphasise the need for vascular health, depression management and early intervention to mitigate cognitive decline.

In addition, there is a relationship between non-infectious diseases such as cancer, hypertension, cardiovascular disease and cognitive impairment, which is increasingly prevalent in older adults. Cancer-related cognitive decline encompasses subjective and objective changes in cognitive function following cancer diagnosis and treatment, affecting language, attention and information processing.[27] Although limited research has explored the relationship between hypertension and cognitive function, a cross-sectional study found a decline in most cognitive domains in older adults with uncontrolled hypertension. Additionally, hypertension is associated with an increased risk of related conditions, such as vascular dementia.[28] Studies focusing on heart failure patients often reveal cognitive impairment in older individuals,[29] with the severity of heart failure linked to lower cognitive function.[30] Heart failure is associated with other vascular diseases, such as valvular heart disease and cerebrovascular disease, which significantly increase the risk of dementia, as highlighted in recent evidence exploring the associations between cardiovascular diseases and cognitive decline.[31]

Sensory impairments have been found to influence cognitive decline in older adults, as supported by various studies.[32,33] This study confirmed that changes in visual and auditory impairments over time significantly affect cognitive function.

The results indicated that diabetes, pulmonary disease and liver disease did not significantly affect cognitive decline. Previous research indicated that the relationship between diabetes and cognitive decline is not straightforward, as multiple factors interact in complex ways. This suggests that factors such as blood sugar control, treatment adherence and lifestyle habits may have a more significant impact on cognitive function than diabetes itself.[34,35] Although cognitive impairment has been linked to chronic obstructive pulmonary disease (COPD) in prior research,[36] our findings did not observe a significant association. These differences may result from factors such as depression, anxiety, physical inactivity or secondary health issues commonly seen in older adults with COPD. The observed associations in other studies may reflect the impact of these factors rather than the diseases themselves. Furthermore, the lack of statistical significance for pulmonary and liver diseases may be due to the small sample size compared to others. Previous studies mainly concentrated on older adults and were predominantly cross-sectional in nature, making it challenging to directly compare the current findings with those of previous studies.[37,38] Further research is needed to explore the complex interactions between these variables and cognitive function in older adults.

Our study analysed data from 2006 to 2020, encompassing a period before and during the onset of the COVID-19 pandemic. The pandemic introduced challenges such as social isolation, reduced physical activity and disrupted health-care access, which are closely linked to depression, anxiety and cognitive decline in older adults. These factors may have exacerbated declines in IADL and ADL, as well as contributed to worsening cognitive impairment.[39]

While our findings align with prepandemic studies, the unique stressors of the pandemic emphasise the importance of targeted interventions. Strategies should focus on reducing isolation, enhancing mental health support and encouraging physical activity to maintain cognitive and functional independence.[40] Future research should explore the long-term cognitive effects of the pandemic and refine approaches to support older adults during similar crises.

In general, ADL and IADL declines and cognitive impairment due to disease over time are considered inevitable changes and are perceived as irreversible. However, some studies have reported cognitive function improvements through rehabilitation programs targeting co-morbidities.[41] In a study focusing on 66 older adults undergoing continuous cardiac rehabilitation, enhanced cognitive function, particularly prefrontal cortical function, was observed. This was accompanied by improvements in arterial stiffness, cardiac function and physical ability. Regular cardiac rehabilitation could enhance cardiovascular and overall physical function in patients with cardiovascular diseases, contributing to improved cognitive function.[41] Participation in exercise programs has been found to effectively improve cognitive function and prevent dementia in older adults with mild cognitive impairment. Therefore, engagement in activities is recommended to improve daily functioning.[42] This is relevant to the diseases examined in this study.

As the ageing population grows and survival rates for cancer and cardiovascular diseases improve, preserving cognitive function and independence while dealing with these diseases is a major concern. Cognitive decline is a feared and debilitating consequence that significantly affects patients' quality of life and prolongs their hospital stay. To address the challenges of cognitive decline and functional limitations among older adults, we recommend implementing structured rehabilitation programs tailored to individuals with chronic conditions.[43] These programs should include physical therapy, occupational therapy and assistive device training to support ADL and IADL maintenance. Additionally, structured physical activity interventions, such as aerobic and resistance exercises, alongside nutritional counselling, can enhance both physical and cognitive health. Policymakers should prioritise national cognitive health campaigns to promote active lifestyles and integrate regular cognitive health assessments into primary care for the early identification of at-risk individuals. Community-based programs that encourage social engagement and lifelong learning should be funded, and digital health tools, such as mobile applications and wearable devices, can provide ongoing support for older adults, particularly those with limited access to health-care facilities.[44] These strategies collectively aim to preserve cognitive function, improve quality of life and reduce the burden of cognitive impairment in ageing populations.

4.1 | Study limitations

This study had several limitations. Although this study utilised the K-MMSE to assess cognitive function and categorise the participants, the absence of clinical diagnostic confirmation for conditions such as dementia limited the ability to definitively differentiate between normal cognitive ageing and early-stage cognitive disorders. This study was based on self-reported measures of several variables, including ADL, IADL, depression and the presence of chronic diseases. Self-reported data are at risk of recall or social desirability bias, which may affect the accuracy of the data and consequently influence the findings. Given the observational nature of the study and the use of the KLoSA, the analysis can identify associations but cannot establish causal relationships. Although the findings demonstrated correlations between the independent variables and cognitive function over time, we cannot interpret these results as evidence of causation. Moreover, the findings of this study are specific to the Korean older adult population; therefore, the generalisability of the results to populations in other countries should be considered. While the study adjusted for several key variables, there may be other confounders, such as socio-economic variables, social activity participation, family structures, lifestyle factors and family history that could influence both independent variables and cognitive function. Future studies should consider controlling for potential confounders.

5 | CONCLUSIONS

This study confirmed that IADL and ADL predict cognitive impairment, with IADL limitation significantly contributing to cognitive decline in adults aged 45 years and older. In addition, cerebrovascular disease and depression emerged as influential factors in diseases associated with cognitive impairment. Evaluating IADL, ADL and high-risk diseases in adults aged 45 years and older can help identify the risk of cognitive impairment in older adults. Maintaining IADL and ADL functions can contribute to the prevention of cognitive decline.

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CONFLICT OF INTEREST STATEMENT

No conflicts of interest declared.

DATA AVAILABILITY STATEMENT

The data that support the findings of this study are openly available in the Employment Information Analysis System of the Korea Employment Information Services (KEIS) at https://survey.keis.or.kr. These data do not have a DOI and can be accessed by registering and logging into the system. The User Guide for the Ageing Study Panel Survey used during this research was published by KEIS in 2022.[15] For access to the most recent data and guidelines, refer to the updated 2024 edition of the User Guide available on the same platform.

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