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Trajectories of Alzheimer's Disease Prevalence among National Health Insurance and Medical Aid Beneficiaries from 2010 to 2019

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Purpose: Alzheimer's disease (AD) is the leading cause of dementia and is associated with various socioeconomic factors. This study aimed to ascertain the differences in AD prevalence based on healthcare coverage type as a proxy of socioeconomic status in South Korea.

Materials and Methods: We examined Health Insurance Review and Assessment Service claims from 2010–2019, identifying AD as the main disease. Crude prevalence rate and age- and sex-standardized prevalence were estimated from healthcare utilization data. Subgroup analysis by age, sex, comorbidities (hypertension, diabetes, and cardiovascular disease), and type of healthcare coverage [Medical Aid (MA) vs. National Health Insurance (NHI)] was performed to estimate the standardized prevalence rate ratio (PRR).

Results: AD prevalence increased 3.9 times from 2010 (175688 cases) to 2019 (680800 cases). In the NHI group, the standardized prevalence increased 2.3-fold (624.4 in 2010 and 1433.2 in 2019), whereas the MA group saw a 2.7-fold increase (1251.0 in 2010 and 3391.9 in 2019). AD was significantly higher in the MA group from 2010 [PRR=2.00, 95% confidence interval (CI) 1.98–2.03] to 2019 (PRR=2.37, 95% CI 2.35–2.38) compared to the NHI group. From 2010 to 2019, a proportion of comorbidities increased in MA and NHI groups. Compared to the NHI group, the MA group showed significantly higher proportion of comorbidities.

Conclusion: In this study, we identified significant differences in AD prevalence between NHI and MA recipients, with a notable increase in the MA group, especially among those under 60 years of age.

Key Words: Alzheimer's disease, National Health Insurance, claims data, Medical Aid

INTRODUCTION

Dementia is a brain disease with physical, psychological, social, and economic effects on cognitive function and daily activities.[1] Alzheimer's disease (AD) is the leading cause of dementia, representing the most fatal and burdensome form of dementia.[2] The most critical risk factor for AD is aging, and the number of AD cases is expected to increase annually.[3] South Korea is expected to transition into a super-aged society by 2025, with over 20% of its population aged 65 years or older. This rapid demographic shift is heightening the social burden associated with an aging population and the increasing prevalence of dementia.[4] In addition to aging, AD has also been identified as a factor associated with education level, income, and higher occupational status, with lower socioeconomic status correlating with an increased risk of AD.[5,6]

South Korea operates a National Health Insurance System, with 97% of Koreans enrolled as National Health Insurance (NHI) beneficiaries. Premiums are calculated based on the in-

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dividual's income level or property value. The remaining 3% are Medical Aid (MA) recipients who are unable to pay premiums. The government covers the medical costs through taxes.[7] South Korea is compulsorily enrolled in the NHI, a social insurance program, and MA, a public assistance program that guarantees a minimum standard of living and supports individuals' independence. Previous studies primarily used healthcare coverage or educational level as proxies to measure the socioeconomic status, which is a risk factor for dementia.[8,9] However, most studies have been cross-sectional, focusing only on selected regions or hospitals or using surveys to calculate the prevalence rates, and there is little evidence on AD prevalence, the leading cause of dementia, based on the socioeconomic status. However, conducting cross-sectional studies, such as questionnaire-based studies, can be challenging, as cognitive decline or memory impairment in people with dementia may skew the data. Therefore, claims data can be a useful research tool for tracking trends in the prevalence of dementia and its subtypes, providing an objective history of care for the entire Korean population.[10]

This study aimed to explore the long-term trends in AD prevalence and their differences according to the type of healthcare coverage. We hypothesized that the risk of AD is higher in socioeconomically disadvantaged healthcare recipients, suggesting potential healthcare policy directions for the screening and management of vulnerable populations.

MATERIALS AND METHODS

Study population

This study used claims data from the Health Insurance Review and Assessment Service (HIRA) with AD as the main disease from 2010 to 2019. The HIRA claims data are national medical use data containing inpatient and outpatient records, including patient information, diagnosis, and treatment. Physicians usually report the International Classification for Diseases 10th Revision (ICD-10) diagnosis codes based on the primary diagnosis code for which the patient's need for care was the greatest and the secondary listed disease code that influenced the patient's care.

We analyzed data from 54978515 individuals with NHI and 2950585 individuals with MA who visited medical institutions at least once between 2010 and 2019. Among them, 1224243 NHI recipients and 237477 MA recipients were diagnosed with AD.

AD diagnosis

The study participants were patients diagnosed with AD (ICD-10 codes: F00.0, F00.1, F00.2, F00.9, G30.0, G30.1, G30.8, and G30.9). These diagnoses were defined as patients who had at least one inpatient or outpatient visit to a medical institution between 2010 and 2019 with an AD diagnosis code and who used anti-dementia medications (donepezil, galantamine, rivastigmine, and memantine).

Prescription history

The HIRA database contains comprehensive information on all healthcare services, including dates of service, diagnosis codes, surgeries, procedures, prescription drugs, and the patient's unique identification number, as part of reviewing and evaluating claims submitted electronically by providers. Donepezil, galantamine, rivastigmine, and memantine were selected from the HIRA's drug prescription database from 2010 to 2019, and patients with a diagnosis code for AD who were prescribed dementia medications were extracted.

Comorbidities

Comorbidities were identified from the HIRA database, which records all disease codes when a patient visits an inpatient or outpatient clinic, including hypertension (I10-15), cardiovascular disease (I20-25), diabetes (E10-14), and stroke (G45-46, I60-64, I67-69). For each year, we tracked the medical records of patients with an AD diagnosis code to extract patients with dementia who had comorbidities up to 1 year prior.

Statistical analysis

We estimated the crude prevalence of AD by the type of healthcare coverage based on the total subscribers of the NHI and MA for each year. The standardized prevalence was calculated by standardizing the 2015 population. The standard population was the total number of subscribers of the NHI and MA in 2015. The crude and standardized prevalence rates were calculated by insurance type, sex, and age groups under 60 and over 60 years. AD is typically categorized as early onset based on an age threshold, typically 65 years of age, but this threshold is arbitrary and a threshold of 60 years of age is also commonly used, as a small percentage of people develop AD at a younger age.[11,12]

The 95% confidence intervals (CIs) were estimated based on the lognormal distribution. Prevalence rate ratio (PRR) is a relative difference measure used to compare the prevalence rates of two groups for cross-sectional designs. The PRR is the proportion of the observed prevalence compared to the prevalence of the reference category. A PRR greater than 1 represents an increase relative to the baseline prevalence, and a PRR less than 1 represents a decrease relative to the baseline prevalence.[13] Using directly standardized rates, we attempted to analyze the PRR of AD according to the type of healthcare coverage and age strata during the study period, based the 2015 population. All statistical analyses were conducted using the STDRATE procedure in SAS version 9.4 (SAS Institute Inc., Cary, NC, USA). The IRB review board approved this study since it utilized secondary data (IRB Institution: Health Insurance Review and Assessment service, IRB approval no: HIRAI-RB-2024-050-002).

RESULTS

Patients with AD

Table 1 shows the number of AD cases identified by insurance type from 2010 to 2019. As shown in Table 1, there was a clear trend in the number of AD cases, with an increase of 3.9 times from 175688 cases in 2010 to 680800 cases in 2019. Among AD patients, the proportion of MA group decreased from 17.1% in 2010 to 15.4% in 2019. However, after stratification of AD patients by insurance type, the proportion of male in the MA group increased from 25.0% in 2010 to 28.8% in 2019.

When analyzing comorbidities among patients with AD from 2010 to 2019, hypertension was the most prevalent, increasing from 64.8% to 69.6% in the NHI group and from 69.3% to 71.7% in the MA group. The proportion of cardiovascular disease and diabetes also increased in both groups. Specifically, the proportion of diabetes increased from 33.1% in 2010 to 38.9% in 2019 in the NHI group and from 33.9% to 43.3% in the MA group, with a larger increase in the MA group. However, the prevalence of stroke decreased in both groups by 6.7%p and 8.9%p, respectively.

Donepezil was the most commonly used dementia drug, increasing from 71.6% in 2010 to 86.5% in 2019 in the NHI group and from 69.7% in 2010 to 87.5% in 2019 in the MA group, followed by memantine, rivastigmine, and galantamine. In 2010, the NHI group used donepezil more than the MA group; however, in 2019, the MA group used donepezil more compared to the NHI group, with 86.5% of NHI and 87.5% of MA using donepezil (Table 2).

Crude and standardized prevalence of AD

The crude prevalence of AD increased in both groups from 2010 to 2019. Throughout the study period, the crude prevalence of AD in the MA group was significantly higher compared to the NHI group. The standardized prevalence increased 2.3 times in the NHI group and increased 2.7 times in the MA group from 2010 to 2019. Notably, the age- and sex-standardized prevalence for the MA group increased significantly from 1251.0 to 3391.9 per 100000 population between 2010 and 2019, which is statistically 2.00–2.37 times higher than the NHI group (624.4–1433.2 per 100000 population) (Table 3). Considering the possibility that individuals initially enrolled in the NHI may have transitioned to MA following the onset of AD, we conducted an additional analysis excluding patients with changes in insurance eligibility. The results were consistent with those presented in Table 3, yielding similar estimates (Supplementary Table 1, only online).

The prevalence of AD was significantly higher in the MA group compared to the NHI group across all age groups (Fig. 1). Notably, there was a substantial increase in AD prevalence among patients under 60 years old in the MA group compared to the NHI group (Fig. 2). A similar increase in AD prevalence was observed in patients aged 60 years and older in the MA

Table 1. Patients with Alzheimer's Disease by Sex and Insurance Type

	2010 (n=175688)	2011 (n=217851)	2012 (n=269522)	2013 (n=316952)	2014 (n=363343)	2015 (n=428423)	2016 (n=485970)	2017 (n=536480)	2018 (n=597594)	2019 (n=680800)
Age (yr)	77.59±8.44	78.06±8.37	78.45±8.33	78.89±8.26	79.33±8.18	79.68±8.18	80.03±8.17	80.44±8.13	80.76±8.07	81.06±8.07
Sex										
Male	52330 (29.8)	63362 (29.1)	77635 (28.8)	90523 (28.6)	102620 (28.2)	121678 (28.4)	138830 (28.6)	153068 (28.5)	171973 (28.8)	198865 (29.2)
Female	123358 (70.2)	154489 (70.9)	191887 (71.2)	226429 (71.4)	260723 (71.8)	306745 (71.6)	347140 (71.4)	383412 (71.5)	425621 (71.2)	481935 (70.8)
NHI	145728 (83.0)	181769 (83.4)	226430 (84.0)	267274 (84.3)	307161 (84.5)	362180 (84.5)	411608 (84.7)	454289 (84.7)	507130 (84.9)	576146 (84.6)
Male	44835 (30.8)	54559 (30.0)	67099 (29.6)	78266 (29.3)	88537 (28.8)	104629 (28.9)	119257 (29.0)	130960 (28.8)	147221 (29.0)	168724 (29.3)
Female	100893 (69.2)	127210 (70.0)	159331 (70.4)	189008 (70.7)	218624 (71.2)	257551 (71.1)	292351 (71.0)	323329 (71.2)	359909 (71.0)	407422 (70.7)
MA	29960 (17.1)	36082 (16.6)	43092 (16.0)	49678 (15.7)	56182 (15.5)	66243 (15.5)	74362 (15.3)	82191 (15.3)	90464 (15.1)	104654 (15.4)
Male	7495 (25.0)	8803 (24.4)	10536 (24.5)	12257 (24.7)	14083 (25.1)	17049 (25.7)	19573 (26.3)	22108 (26.9)	24752 (27.4)	30141 (28.8)
Female	22465 (75.0)	27279 (75.6)	32556 (75.6)	37421 (75.3)	42099 (74.9)	49194 (74.3)	54789 (73.7)	60083 (73.1)	65712 (72.6)	74513 (71.2)

NHI, National Health Insurance; MA, Medical Aid.
Data are presented as mean±standard deviation or n (%).

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Table 2. Comorbidities and Drugs of Alzheimer's Disease Cases from 2010 to 2019

	2010	2011	2012	2013	2014	2015	2016	2017	2018	2019
Comorbidity*										
NHI										
Hypertension	94382 (64.8)	117400 (64.6)	149233 (65.9)	177532 (66.4)	205443 (66.9)	243468 (67.2)	278278 (67.6)	309032 (68.0)	348049 (68.6)	400881 (69.6)
Cardiovascular	24594 (16.9)	29750 (16.4)	37310 (16.5)	44443 (16.6)	53199 (17.3)	63456 (17.5)	72431 (17.6)	79891 (17.6)	90976 (17.9)	104254 (18.1)
Diabetes	48195 (33.1)	60897 (33.5)	77548 (34.3)	93334 (34.9)	108321 (35.3)	130393 (36.0)	151024 (36.7)	169903 (37.4)	194123 (38.3)	224360 (38.9)
Strokes	66596 (45.7)	79387 (43.7)	96458 (42.6)	110165 (41.2)	122922 (40.0)	142520 (39.4)	159247 (38.7)	171447 (37.7)	191457 (37.8)	224894 (39.0)
MA										
Hypertension	20755 (69.3)	25136 (69.7)	30347 (70.4)	35123 (70.7)	39809 (70.9)	46965 (70.9)	52599 (70.7)	58306 (70.9)	64277 (71.1)	74982 (71.7)
Cardiovascular	5378 (18.0)	6259 (17.4)	7586 (17.6)	8882 (17.9)	10361 (18.4)	12456 (18.8)	13965 (18.8)	15569 (18.9)	17453 (19.3)	20384 (19.5)
Diabetes	10148 (33.9)	12456 (34.5)	15552 (36.1)	18226 (36.7)	21139 (37.6)	25467 (38.4)	29663 (39.9)	33712 (41.0)	38101 (42.1)	45329 (43.3)
Strokes	14562 (48.6)	16735 (46.4)	19382 (45.0)	21746 (43.8)	23791 (42.4)	27373 (41.3)	30336 (40.8)	32425 (39.5)	35147 (38.9)	41592 (39.7)
Drug*										
NHI										
Donepezil	104390 (71.6)	134501 (74.0)	173124 (76.5)	210725 (78.8)	247873 (80.7)	296843 (82.0)	343147 (83.4)	385627 (84.9)	435814 (85.9)	498266 (86.5)
Galantamine	19991 (13.7)	20553 (11.3)	19740 (8.7)	17064 (6.4)	17026 (5.5)	18054 (5.0)	19456 (4.7)	19504 (4.3)	19848 (3.9)	22655 (3.9)
Rivastigmine	13938 (9.6)	17405 (9.6)	22035 (9.7)	25357 (9.5)	28993 (9.4)	33517 (9.3)	33747 (8.2)	32554 (7.2)	33415 (6.6)	36261 (6.3)
Memantine	27714 (19.0)	32840 (18.1)	38149 (16.9)	40739 (15.2)	50563 (16.5)	68882 (19.0)	81629 (19.8)	94505 (20.8)	107383 (21.2)	126053 (21.9)
MA										
Donepezil	20887 (69.7)	26321 (73.0)	32881 (76.3)	39450 (79.4)	45813 (81.5)	54732 (82.6)	62458 (84.0)	70462 (85.7)	78587 (86.9)	91564 (87.5)
Galantamine	3595 (12.0)	3662 (10.2)	3215 (7.5)	2595 (5.2)	2617 (4.7)	2699 (4.1)	2803 (3.8)	2717 (3.3)	2729 (3.0)	3319 (3.2)
Rivastigmine	2042 (6.8)	2467 (6.8)	2865 (6.7)	3184 (6.4)	3674 (6.5)	4391 (6.6)	4243 (5.7)	4164 (5.1)	4184 (4.6)	4644 (4.4)
Memantine	7435 (24.8)	8010 (22.2)	8789 (20.4)	8967 (18.1)	9778 (17.4)	12791 (19.3)	14654 (19.7)	16657 (20.3)	18423 (20.4)	21719 (20.8)

NHI, National Health Insurance; MA, Medical Aid.
The values in parentheses are percentages.
*Percentages may add up to >100% due to multiple diagnoses in the same patient.

group compared to the NHI group.

DISCUSSION

Using the NHI claims data, we identified differences in long-term trends in the prevalence of AD based on the type of healthcare coverage, which served as a proxy for socioeconomic status. Additionally, the proportion of comorbidities varied between the MA and NHI groups. During the study period, the number of MA beneficiaries with AD increased 3.5 times, with the prevalence 5.47 times higher in the MA group compared to

Table 3. Crude and Standardized Prevalence of Alzheimer's Disease per 100000 Population

Year	NHI		MA		Rate ratio†
	Crude	Standardized*	Crude	Standardized*	
2010	472.1 (469.7–474.5)	624.4 (621.2–627.7)	2636.1 (2606.3–2666.0)	1251.0 (1234.6–1267.5)	2.00 (1.98–2.03)
2011	575.8 (573.2–578.5)	735.8 (732.4–739.2)	3256.7 (3223.0–3290.3)	1500.7 (1482.7–1518.8)	2.04 (2.01–2.07)
2012	703.1 (700.2–706.0)	858.8 (855.2–862.4)	4068.2 (4029.8–4106.6)	1793.8 (1773.9–1813.8)	2.09 (2.06–2.11)
2013	815.2 (812.2–818.3)	955.2 (951.6–958.9)	4766.8 (4724.9–4808.7)	2035.9 (2014.7–2057.1)	2.13 (2.11–2.16)
2014	922.8 (919.5–926.0)	1031.9 (1028.2–1035.5)	5380.0 (5335.5–5424.5)	2235.3 (2213.5–2257.1)	2.17 (2.14–2.19)
2015	1075.5 (1072.0–1079.0)	1155.4 (1151.6–1159.1)	5864.3 (5819.6–5908.9)	2408.1 (2386.7–2429.6)	2.08 (2.06–2.10)
2016	1206.3 (1202.7–1210.0)	1237.2 (1233.4–1241.0)	6622.0 (6574.4–6669.6)	2674.0 (2651.6–2696.5)	2.16 (2.14–2.18)
2017	1315.9 (1312.0–1319.7)	1272.6 (1268.9–1276.3)	7288.0 (7238.2–7337.9)	2869.1 (2846.0–2892.2)	2.25 (2.24–2.27)
2018	1452.3 (1448.3–1456.3)	1342.9 (1339.2–1346.6)	7873.0 (7821.7–7924.3)	3040.9 (3017.4–3064.4)	2.26 (2.25–2.28)
2019	1623.8 (1619.6–1628.0)	1433.2 (1429.5–1436.9)	8888.4 (8834.6–8942.3)	3391.9 (3367.6–3416.2)	2.37 (2.35–2.38)

NHI, National Health Insurance; MA, Medical Aid.
The values in parentheses are 95% confidence intervals.
*For estimation of age- and sex-standardized prevalence, the total beneficiaries of NHI and MA of 2015 were used; †Age- and sex-adjusted prevalence ratios (NHI vs. MA).

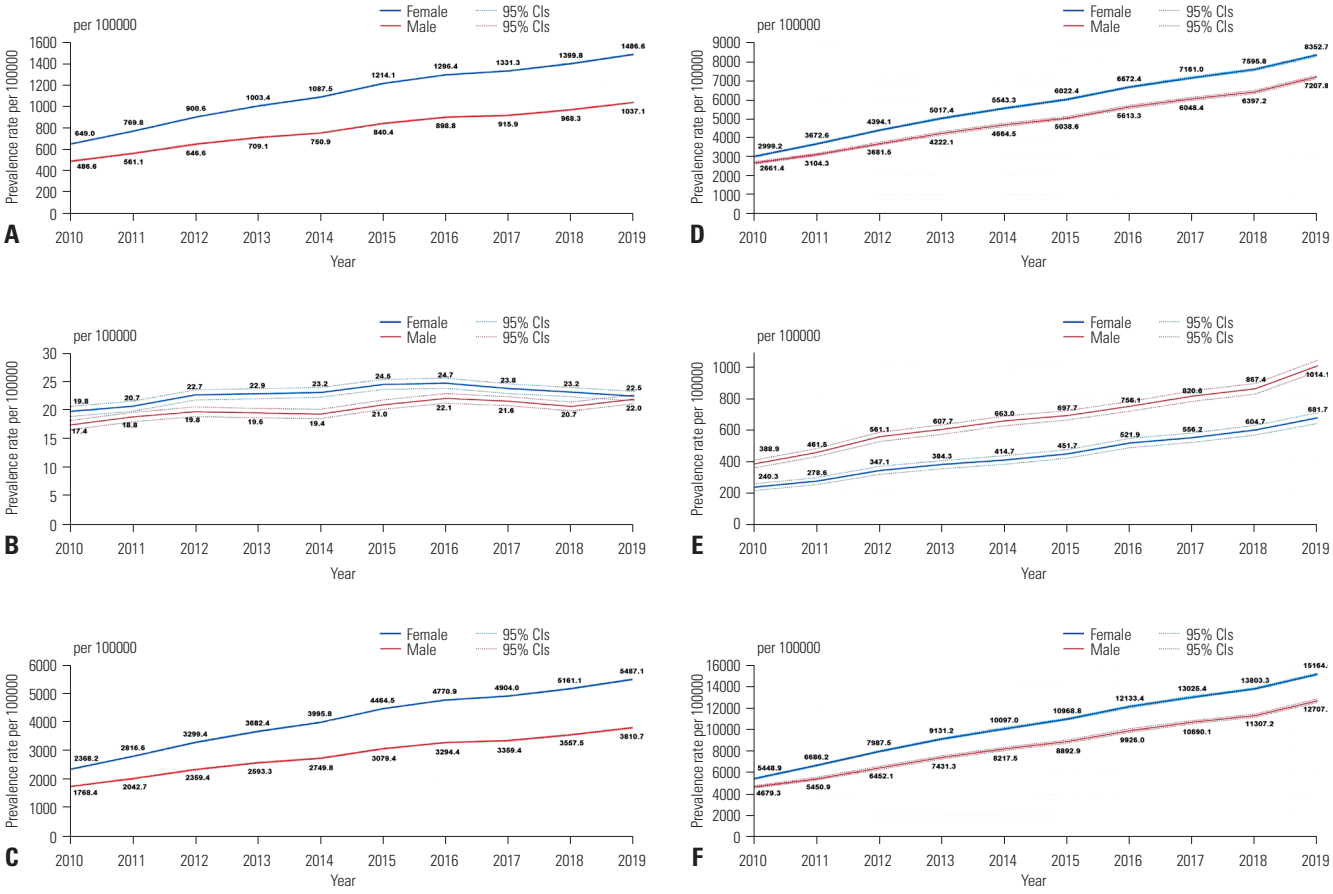

Fig. 1. Age-standardized prevalence of Alzheimer's disease per 100000 population from 2010 to 2019 analyzed according to sex. For estimation of age-standardized prevalence, the total beneficiaries of NHI and MA of 2015 were used. (A) NHI, all ages. (B) NHI, <60 years. (C) NHI, ≥60 years. (D) MA, all ages. (E) MA, <60 years. (F) MA, ≥60 years. NHI, National Health Insurance; MA, Medical Aid; CI, confidence interval.

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Fig. 2. PRR of Alzheimer's disease per 100000 population analyzed according to type of healthcare coverage. For estimation of age-standardized prevalence, the total beneficiaries of NHI and MA of 2015 were used. (A) <60 years. (B) ≥60 years. PRR, prevalence rate ratio; NHI, National Health Insurance; MA, Medical Aid; CI, confidence interval.

the NHI group. Notably, the MA group aged under 60 years showed a significantly higher prevalence compared to the NHI group.

In the present study, the number of patients increased 3.9 times from 2010 to 2019. Interestingly, age- and sex-standardized prevalence rates were 2.00–2.37 times higher in the MA group than in the NHI group.

A meta-analysis of 11 dementia epidemiology studies published between 1990 and 2013 found that the prevalence of AD has been steadily increasing, with the prevalence of AD rising from 5.0% to 6.5%.[14] Regarding the prevalence of dementia based on the type of healthcare coverage, a previous study conducted in 2019, which enrolled 15043 adults aged 60 years or older, found that the prevalence of patients with dementia in the MA group was 6.6%. This prevalence was higher than that observed in the NHI group [hazard ratio (HR) 1.77, 95% CI 1.421–2.215].[15] Moreover, the Epidemiological Investigation of Dementia studies conducted in 2008, 2012, and 2016 reported a 1.88 (1.33–2.65), 10.49 (5.16–21.36), and 4.72 (2.43–9.15) times higher risk of dementia in patients among MA than among those in NHI, respectively.[16-19] Furthermore, in a previous study using the HIRA's sample claims data (1161198 patients), the MA group accounted for 7.7% of the total patients but 15.8% of those with dementia in 2015.[20] There is little evidence on the prevalence of AD by socioeconomic status, but when we look at dementia, of which AD is the most common cause, our findings were consistent with those of a previous study.

Several studies have identified associations between AD and various socioeconomic groups. A Swedish cohort study that followed 931 participants aged ≥75 for 3 years reported that lower education and socioeconomic status were associated with an increased risk of AD (relative risks=3.1, 95% CI 1.6–5.8).[21] In a UK cohort study, the HR for AD, after adjusting for sex and age, was 1.60 (95% CI 1.32–1.93) for middle socioeconomic groups and 3.06 (95% CI 2.54–3.68) for low SES groups, with the HR increasing among lower socioeconomic groups.[22] Therefore, individuals from socioeconomically disadvantaged groups have a higher prevalence of dementia compared to those from more affluent groups across various wealth segments.[23-26]

In this study, the standardized prevalence of AD across all age groups was higher in the MA group than in the NHI group, with the highest increase shown in patients under 60 years of age, from 16.46 times in 2010 to 33.50 times in 2019 for male and from 8.59 times in 2010 to 21.84 times in 2019 for female. In a previous study on dementia using customized claims data from the NHI Service from 2015 to 2020, the prevalence of ear-

ly dementia increased by 8% in 2020 compared to 2015 in the lowest income quintile (quintiles 1 to 5), and senile dementia was more prevalent in the highest income quintile (38.2% in 2015 to 46.2% in 2020 for male and 21.2% to 29.3% for female).[27] Therefore, these findings confirm that the prevalence of early-onset AD is higher among the MA groups in terms of socioeconomic status. Considering these characteristics, it is necessary to investigate the prevalence of AD in detail and to prepare dementia plans.

The increase in the prevalence of AD can be attributed to the establishment of the government's comprehensive dementia management plan, which has led to more individuals being diagnosed. Specifically, the rise is due to a dementia diagnosis becoming a prerequisite for alleviating treatment costs. Programs include low-income dementia screening, drug cost support, and treatment management cost assistance. In 2016, the number of patients with dementia from the claims data and the Dementia Epidemiology Survey were similar; in 2020, the number of patients with dementia from the claims data and the Dementia Epidemiology Survey were highly consistent, indicating that the majority of patients with dementia were diagnosed through the NHI and MA.[28,29]

Consistent with previous studies, we found a higher prevalence of AD in female than in male,[30-32] and the prevalence continued to increase in both male and female. Notably, the prevalence of AD with MA in patients under 60 years of age was higher among male than among female, and the difference in prevalence between MA and NHI patients was greater among men under 60 years of age. Alcohol use disorders, substance abuse, and heart and cerebrovascular disease are major risk factors associated with cognitive decline and dementia, and these conditions are more common in male than female, which explains an important part of the association between male and early-onset dementia.[33-35] In addition, MA benefits are a public assistance program for people who are unable to support themselves or have difficulty making ends meet. The study, which analyzed a cohort of individuals in their 40s in Australia, found that dementia risk factors in the medical and genetic domains, such as stroke and high blood pressure, were associated with memory decline in female, while lifestyle risk factors, such as smoking and financial problems, were associated with memory decline in male.[36] Also, a previous study using health insurance claims data similarly found a higher proportion of male with early-onset dementia in the MA group under age 65 (male: 64.26%; female: 35.74%).[37]

In the present study, from 2010 to 2019, there was a significant increase in the use of donepezil, which is used to improve cognitive function in patients with dementia, with a rise of 14.9%p for NHI beneficiaries and 17.8%p for MA beneficiaries. Donepezil was the most commonly used drug in NHI (86.5%) and MA (87.5%) recipients, followed by memantine (21.9% in NHI and 20.8% in MA recipients). Galantamine and rivastigmine were used by only 6.3% or less of both groups in 2019. Donepezil, galantamine, rivastigmine, and memantine are primarily subsidized for low-income patients as part of the government's efforts to enhance support policies aimed at delaying the progression of dementia symptoms.[38] Consequently, there is no difference in the use of dementia drugs between the NHI and MA. This is a positive outcome of government policies, such as the National Dementia Responsibility System and the Comprehensive Dementia Management Plan.

Except for stroke, the proportion of comorbidities such as hypertension, diabetes, and cardiovascular disease increased in both MA and NHI beneficiaries. Interestingly, the MA group had a significantly higher percentage of comorbidities compared to the NHI group. In 2012, of the 5312 individuals over 60 years of age with dementia enrolled in the Seoul Dementia Management Project, 61.6% had hypertension, 31.8% had diabetes, 21.4% had a stroke, and 11.1% had heart disease.[13] Studies from Taiwan, Sweden, and the United States have provided a range of estimates for the prevalence of comorbidities in AD patients (hypertension: 51.3%–74.8%; diabetes: 15.7%–28.9%; stroke: 13.7%–21.8%; cardiovascular: 10.0%–22.7%), with a higher prevalence of hypertension and diabetes comorbidities in AD patients overall.[39-42]

These comorbidities worsen functional changes or the progression of dementia and limit the management of the quality of life, dementia, and comorbidities. Thus, it is essential to identify continuous trends in comorbidities to prevent and manage dementia.[9]

This study had some limitations. One limitation is that it analyzed patients with AD using diagnosis codes from secondary administrative data, which may introduce errors if providers inaccurately listed or omitted diagnosis codes that differ from the patient's actual condition. However, in 2020, the number of dementia patients based on the government's Dementia Epidemiology Survey was 96.8%, consistent with the number calculated from disease codes in health insurance claims data,[29] indicating that most dementia patients were diagnosed through health insurance, and there is no significant difference between the epidemiological survey results and the number of dementia patients in the claims data recently. Also, medical benefit recipients are less likely to visit the hospital compared to health insurance recipients due to out-of-pocket and non-covered medical service expenses. Thus, the difference between the two groups in this study is likely an underestimate of the true difference. Therefore, it is essential to support dementia screening to encourage early diagnosis and strengthen comorbidity management to prevent delays in dementia care among MA beneficiaries. Another limitation is that, since the type of healthcare coverage is used as a proxy variable for socioeconomic status, it does not represent patients' socioeconomic status. Given that claims data are administrative data for reimbursement purposes, they only collect the information needed for claims review and do not collect information about the patient's education, income, and financial status. Nevertheless, this study is

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the first in South Korea to analyze the differences in the prevalence of AD according to socioeconomic factors using long-term NHI claims data.

The main findings of our study were that the prevalence of AD was higher in the MA group compared to the NHI group, and that the prevalence of early-onset AD was also increasing. Although South Korea provides universal healthcare coverage under its NHI system, some tests and treatments are still not covered under the NHI system; as a result, low-income patients may not have received timely access to tests or treatments that are not covered under the NHI.[37] In response, South Korea operates dementia care centers across the country to provide low-income dementia patients with financial support for treatment and early dementia screening. Also, the government established the 3rd Comprehensive Plan for Dementia Management to set dementia-related policy contents in 2015, setting policy contents and targets related to dementia based on statistics to enhance policy effectiveness through quantification as much as possible.[38] Since 2017, the National Responsibility Policy for Dementia Care has been implemented. However, this support is only available to individuals over the age of 60 diagnosed with dementia.

In 2020, the government established the 4th Dementia Management Plan based on the 3rd Dementia Management Plan, which abolished the age threshold for eligibility and relaxed the income threshold to strengthen early dementia screening and support for low-income people.[43] Our study extends this evidence to inform the government's detailed dementia policy plan by providing information on the current AD status according to socioeconomic status over time.

In the future, the status of AD, which can be used as a basis for national policies, requires a more detailed analysis reflecting socioeconomic aspects. It is necessary to prepare dementia prevention and management policies according to patient characteristics and socioeconomic status rather than one-sided dementia support.

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AUTHOR CONTRIBUTIONS

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