Research article

Association between the coronavirus disease pandemic and antipsychotic drug prescriptions among patients with dementia

Journal of Alzheimer's Disease Reports
Volume 10: 1–10

DOI: 10.1177/25424823261435562
journals.sagepub.com/home/alr

Kyungduk Hurh[1,2,3], Hyunkyu Kim[3,4] and Eun-Cheol Park[3,5]

Abstract

Background: Antipsychotics are frequently prescribed off-label to manage behavioral and psychological symptoms of dementia but pose safety risks in older adults, including a 1.5–2.0-fold increased risk of mortality. The coronavirus disease (COVID-19) pandemic disrupted dementia care, increasing reliance on pharmacologic treatments.

Objective: This study aimed to evaluate whether the COVID-19 pandemic was associated with changes in the prevalence of antipsychotic prescribing among patients with dementia.

Methods: Using the Korean National Health Insurance Database, this study analyzed a random 50% sample of eligible individuals aged ≥60 years diagnosed with dementia between 2016 and 2021 (n = 876,158; 9.8 million person-observations). Outcomes included the likelihood, duration, and number of antipsychotic prescriptions issued, characterizing pharmacologic management of dementia. Interrupted time series analysis assessed associations between the pandemic and relative changes in these outcomes, adjusting for demographic factors, comorbid burden, and seasonality.

Results: After the pandemic onset, there were relative slope increases per quarter of 1.5%, 3.2%, and 0.4% in the likelihood, duration, and number of prescriptions, respectively (all $p < 0.001$; pre-pandemic levels: 0.172 patients prescribed, 12.97 days, and 18.10 prescriptions per person-quarter). Antipsychotic prescriptions decreased by 1.6% ($p < 0.001$) during the first quarter after the outbreak but subsequently showed a progressive increase, reflecting prolonged care disruption after initial access barriers.

Conclusions: The COVID-19 pandemic was associated with increased antipsychotic prescribing among patients with dementia. To mitigate similar effects in future public health crises, governments and healthcare providers should strengthen mental health support, non-pharmacological interventions, telehealth continuity, and tailored prescribing guidelines.

Keywords

Alzheimer's disease, antipsychotics, behavioral and psychological symptoms of dementia, coronavirus disease, dementia, interrupted time series analysis

Received: 12 December 2025; accepted: 3 March 2026

Introduction

As South Korea experiences an unprecedented rate of population aging and approaches a super-aged society according to the United Nations Economic and Social Commission for Asia and the Pacific (≥21% of the population aged ≥65 years),[1,2] the burden of dementia, one of the most prevalent age-related diseases, continues to rise. According to the Korean National Institute of Dementia, approximately 911,760 individuals aged ≥60 years were estimated to have all-cause dementia in 2023, corresponding to a prevalence of 6.78%, based on nationally representative surveys

[1]Department of Preventive Medicine, Gachon University College of Medicine, Seongnam-si, Republic of Korea
[2]Artificial Intelligence and Big-Data Convergence Center, Gil Medical Center, Incheon, Republic of Korea
[3]Institute of Health Services Research, Yonsei University, Seoul, Republic of Korea
[4]Department of Psychiatry, National Health Insurance Service Ilsan Hospital, Ilsan, Republic of Korea
[5]Department of Preventive Medicine, Yonsei University College of Medicine, Seoul, Republic of Korea

Corresponding author:
Eun-Cheol Park, Department of Preventive Medicine, Yonsei University College of Medicine, 50-1 Yonsei-ro, Seodaemun-gu, Seoul 03722, Republic of Korea.
Email: ecpark@yuhs.ac

using standardized clinical assessments conducted at regional dementia centers.[3] Dementia imposes substantial physical, psychological, and socioeconomic burdens not only on patients but also on caregivers, particularly family members. Behavioral and psychological symptoms of dementia (BPSD) are major contributors to caregiver burden and hospitalization among patients with dementia.[4–6] These symptoms, such as agitation, aggression, and psychosis, often prompt antipsychotic prescribing to manage acute behavioral crises, particularly when non-pharmacological interventions are insufficient, unavailable, or difficult to implement in routine care settings.[7]

However, antipsychotic use in older patients with dementia has been associated with serious adverse outcomes, including a 1.5–2.0 fold increased mortality[8–10] and cerebrovascular events,[11,12] as demonstrated in large observational studies and meta-analyses.

Recognizing these risks, the U.S. Food and Drug Administration has not approved antipsychotics for treating BPSD in older adults, and current clinical guidelines recommend their use only when non-pharmacologic therapies have failed and the expected benefits outweigh the potential harm.[7,13] In Korea, the Ministry of Food and Drug Safety provides official information on the risks associated with antipsychotic use in older adults, including increased mortality and cerebrovascular events. In addition, the Health Insurance Review and Assessment Service has published a national guideline on antipsychotic use for hospitalized older patients in long-term care hospitals.[14]

The coronavirus disease (COVID-19) pandemic and public health restrictions introduced in early 2020 profoundly affected patients with dementia. Limitations on gatherings and the closure of community facilities disrupted daily routines and reduced social interaction.[15,16] As healthcare resources were redirected toward infection control, patients with dementia received less medical and social support (e.g., suspension of in-person programs at community dementia centers), raising concerns about exacerbated BPSD and greater reliance on pharmacologic interventions.[17–20] Conceptually, public health restrictions may be associated with reduced social and clinical support, potentially contributing to worsened BPSD and greater reliance on pharmacologic management such as antipsychotic use (Supplemental Figure 1).

Because patients with dementia are generally older, dependent on caregivers, and vulnerable to isolation, they may have been disproportionately affected by pandemic-related restrictions, with potentially greater impacts among socially disadvantaged groups, such as rural caregivers and low-income households.[21,22] Previous studies have reported increased rates of neuropsychiatric symptoms and additional cognitive decline among patients with dementia during lockdowns.[23,24] Although some early investigations suggested heightened antipsychotic use among patients with dementia during the pandemic's initial phase, these studies were constrained by small sample sizes, limited follow-up durations, and lack of appropriate comparison groups.[25,26] Subsequent large-scale studies have reported inconsistent findings, with a multinational analysis showing sustained increases in antipsychotic prescribing among people with dementia,[27] whereas a population-based study in Wales observed only slight increases that were unlikely to be attributable solely to the pandemic.[28]

Given these uncertainties, the present study aimed to evaluate the association between the COVID-19 pandemic and antipsychotic prescription patterns among older adults with dementia using data from the Korean National Health Insurance Database (NHID), which encompasses approximately half of all dementia cases nationwide. By leveraging this large, nationally representative sample, a 69-month observation period spanning both pre- and post-pandemic phases, and an interrupted time-series (ITS) design that accounts for underlying prescribing trends, our study addresses limitations of prior research.

Methods

Data source

Data were obtained from the Korean NHID, maintained by the National Health Insurance Service (NHIS), which provides universal health coverage for approximately 97% of the South Korean population (approximately 50 million individuals). The remaining 3%, beneficiaries of the Medical Aid Program, are also managed by the NHIS, making the NHID representative of nearly the entire Korean population. The NHID contains anonymized information on demographics, healthcare utilization, and prescription records, which comprehensively capture medication prescriptions across all care settings, including outpatient visits, inpatient hospitalizations, and pharmacy claims. All participants were followed until loss of eligibility due to death or emigration.[29] Emigration in the NHID refers to legal overseas emigration officially reported to the government, which results in termination of National Health Insurance eligibility; given its extremely low frequency relative to the total population, the potential for bias due to emigration-related loss of follow-up is minimal (Supplemental Methods).

Study population

We analyzed a 50% random sample of individuals aged ≥60 years who had at least one inpatient or outpatient claim with a dementia diagnosis (ICD-10 codes F00, F01, F02, F03, G30, G31.00, or G31.82), regardless of specialist confirmation, between February 1, 2016, and October 31, 2021. The age threshold of ≥60 years was chosen to align with national dementia epidemiological surveillance in

Korea, which routinely reports dementia epidemiology among adults aged 60 years and older.[3] Simple random sampling was adopted to ensure computational feasibility for large-scale longitudinal analyses of the entire nationwide claims database while preserving the representativeness of the target population, encompassing approximately half of all individuals aged ≥60 years with dementia nationwide. Data for each participant were divided into consecutive 3-month intervals to capture longitudinal trends in antipsychotic prescriptions. Analyses included both incident and prevalent dementia cases, restricted to observation periods after the first recorded dementia diagnosis to ensure clinical relevance to dementia care. Observations with missing covariate data and those from patients hospitalized in long-term care hospitals (LTCHs) for the entire interval were excluded because antipsychotic prescription data were unavailable for this group.

Over the 69-month follow-up period with 3-month intervals, 876,158 patients with dementia contributed 9,821,803 person-observations to the final analysis.

Variables

The exposure variable was a binary indicator distinguishing pre- and post-COVID-19 periods, with February 1, 2020, defined as the intervention point, reflecting the timing of South Korea's first confirmed COVID-19 case in late January 2020 and the initiation of nationwide infection-control measures from early February, as indicated by the government stringency index (Supplemental Figure 2).[30] The post-pandemic period spanned 21 months (7 intervals) through October 31, 2021, while the pre-pandemic period spanned 48 months (16 intervals) between February 1, 2016, and January 31, 2020.

Outcomes

The primary outcome was whether each patient with dementia received an antipsychotic prescription during each 3-month interval. All antipsychotic prescriptions recorded in NHID, reflecting medications prescribed and dispensed under the fee-for-service system, were included, regardless of pro re nata (PRN) use or inpatient or outpatient setting. Secondary outcomes were prescription duration and frequency within each interval. Prescription duration was defined as the total number of days within each 3-month interval covered by any antipsychotic medication, regardless of agent. Prescription frequency was defined as the total number of antipsychotic prescription claims within each interval, with multiple claims counted cumulatively. For prescriptions spanning multiple intervals, covered days were allocated to each interval based on calendar overlap, preventing double counting.

Covariates

Covariates included sex (male or female), age (continuous), residential area (capital, metropolitan, urban, or rural), household income level (quintiles), health insurance type (employee-based, local subscriber, or medical aid), registered disability (yes or no), Charlson Comorbidity Index (CCI; ≤1, 2, ≥3), years since dementia diagnosis (<1, 1–4, ≥5), continuous time variable (3-month intervals), seasonal effects (per interval), and an offset variable reflecting individual observation periods. The CCI score was calculated based on the Quan ICD-10 coding framework, with comorbid conditions identified using a commonly applied repeated-claim criterion (at least two outpatient visits or one hospital admission within the preceding two years) to enhance diagnostic specificity.[31,32]

Statistical analysis

An ITS analyses of individual-level claims data were conducted to assess longitudinal changes in antipsychotic prescriptions before and after the COVID-19 pandemic. The ITS model included three temporal parameters: baseline trend, level change at the pandemic's onset, and slope change thereafter. Each 3-month period (person-quarter) served as the analytical unit. The level change represented the immediate effect of the pandemic (the difference in outcome levels at the time of the COVID-19 outbreak) whereas the slope change captured differences in trends between pre- and post-pandemic periods. The baseline trend was specified as linear, consistent with standard ITS practice; non-linear components were not formally examined.

Generalized estimating equation (GEE) models were used: a logit link with binomial distribution between the COVID-19 pandemic and the likelihood of antipsychotic prescriptions. For countable outcomes (duration and number of antipsychotic prescriptions), GEE models with a log link and Poisson distribution were applied. An autoregressive working correlation matrix accounted for repeated measures within individuals. The autoregressive working correlation structure was specified a priori to reflect temporal dependence across adjacent intervals. As likelihood-based goodness-of-fit statistics are limited for GEE models, model adequacy was assessed based on model convergence.

The ITS model was specified as follows, for patient i at time t:

$$g(E[Y_{it}]) = \beta_0 + \beta_1 * Time_t + \beta_2 * Pandemic_t + \beta_3 * Time\ after\ pandemic_t + \phi_q * Season_q + \lambda_v * X_{vit}$$

Here, β_0 represents the baseline level, β_1 the baseline slope, β2 the immediate level change after the pandemic, and β_3 the post-pandemic slope change. The sum of β_1 and β_3 indicates the overall post-pandemic trend.[33]

Additional analyses explored whether public health policy stringency or time elapsed since the outbreak influenced antipsychotic prescriptions. Instead of a binary pandemic indicator, models incorporated either the government stringency index, modeled as a continuous variable scaled to represent a 5-point increase in the original 0–100 index (i.e., per 5-point increase), or categorical time variables representing each period after the COVID-19 outbreak (1–3, 4–6, 7–9, 10–12, 13–15, 16–18, and 19–21 months).[34]

Subgroup analyses were performed to descriptively examine temporal patterns in the association between the likelihood of antipsychotic prescriptions and the COVID-19 pandemic according to the type of medical service (outpatient versus inpatient settings), without formal testing of interaction terms.

To contextualize changes in antipsychotic prescribing, we additionally performed an interrupted time series analysis of healthcare utilization among patients with dementia, including outpatient visit frequency and likelihood of admission, using the same modeling approach as the primary analysis.

Sensitivity analyses were conducted to assess the robustness of the main findings under alternative assumptions. First, analyses were repeated using a more stringent definition of dementia, requiring at least two claims with a dementia diagnosis and at least one prescription for an antidementia medication (donepezil, rivastigmine, galantamine, or memantine). Second, to evaluate the sensitivity of results to the choice of intervention timing, the pandemic onset was alternatively defined as May 1, 2020. Third, to account for potential overdispersion in count outcomes, additional models were fitted using generalized estimating equations with a negative binomial distribution.

All analyses were performed using SAS Enterprise Guide (version 7.1; SAS Institute, Cary, NC, USA). A two-sided $p < 0.05$ was considered statistically significant.

Results

The final analytic sample consisted of 9,821,803 person-quarter observations across 23 three-month intervals. Individuals contributed multiple observations over time, yielding 6,243,936 pre-pandemic and 3,577,867 post-pandemic observations (Supplemental Figure 3). The mean patient age increased from 79.6 years (SD = 8.0) before the pandemic to 80.5 years (SD = 7.9) after. The proportion of patients with dementia diagnosed for ≥5 years rose from 24.9% pre-pandemic to 30.3% post-pandemic (Table 1).

Following the onset of the COVID-19 pandemic, the proportion of patients receiving antipsychotic prescriptions increased from 0.172 to 0.181 per person-quarter (relative increase, 5.3%), corresponding to approximately 9 additional patients with prescription per 1000 person-quarters. Similarly, prescription duration rose from 12.97 to 14.26 days per person-quarter (relative increase, 10.0%), and the number of prescriptions increased from 18.10 to 21.15 per person-quarter (relative increase, 16.9%) (Supplemental Table 2).

In ITS analyses adjusted for demographic and clinical covariates, antipsychotic prescribing exhibited significant post-pandemic changes across all outcomes (Figure 1; Table 2). Before the COVID-19 outbreak, the baseline trend in antipsychotic prescribing was stable in the primary ITS analysis ($Exp\beta = 1.000$; 95% CI, 0.999–1.001; $p = 0.496$). Immediately after the pandemic, the likelihood of receiving an antipsychotic prescription decreased by 2.7% ($Exp\beta = 0.973$; 95% CI, 0.967–0.979; $p < 0.001$), and prescription duration decreased by 1.8% ($Exp\beta = 0.982$; 95% CI, 0.976–0.987; $p < 0.001$). Both outcomes subsequently increased, with post-pandemic slope changes of 1.5% ($Exp\beta = 1.015$; 95% CI, 1.013–1.017; $p < 0.001$) and 3.2% ($Exp\beta = 1.032$; 95% CI, 1.027–1.037; $p < 0.001$) per 3-month interval, respectively. The number of prescriptions increased immediately by 2.7% ($Exp\beta = 1.027$; 95% CI, 1.019–1.034; $p < 0.001$) and continued to rise by 0.4% per 3-month interval thereafter ($Exp\beta = 1.004$; 95% CI, 1.002–1.006; $p < 0.001$).

In additional ITS analyses incorporating elapsed time since the COVID-19 outbreak, prescription likelihood increased progressively after pandemic onset. Compared with the pre-pandemic period, likelihood was 1.6% lower during the first 3 months ($Exp\beta = 0.984$; 95% CI, 0.978–0.991; $p < 0.001$), 3.8% higher at 4–6 months ($Exp\beta = 1.038$; 95% CI, 1.030–1.046; $p < 0.001$), 4.1% higher at 10–12 months ($Exp\beta = 1.041$; 95% CI, 1.031–1.046; $p < 0.001$), and 8.9% higher at 19–21 months ($Exp\beta = 1.089$; 95% CI, 1.075–1.103; $p < 0.001$). Moreover, a 5-point increase in the government stringency was associated with a 0.01% decrease in the likelihood of antipsychotic prescription, corresponding to a statistically significant but minimal magnitude ($Exp\beta = 0.999$; 95% CI, 0.998–0.999; $p < 0.001$) (Table 3).

Subgroup analyses by care setting revealed distinct patterns. In outpatient settings, the likelihood of antipsychotic prescriptions decreased immediately by 3.0% ($Exp\beta = 0.970$; 95% CI, 0.965–0.975; $p < 0.001$) but subsequently showed a 1.7% relative slope increase ($Exp\beta = 1.017$; 95% CI, 1.015–1.019; $p < 0.001$) after the pandemic, indicating a biphasic pattern over time. Among hospitalized patients with dementia, prescription likelihood increased immediately by 4.6% ($Exp\beta = 1.046$; 95% CI, 1.003–1.090; $p < 0.001$), followed by a slope decrease of 1.0% per interval ($Exp\beta = 0.990$; 95% CI, 0.981–0.999; $p < 0.001$). Prior to the pandemic, hospitalized patients exhibited an increasing baseline trend in antipsychotic prescribing ($Exp\beta = 1.008$; 95% CI, 1.005–1.010; $p < 0.001$), whereas after the pandemic began, no statistically significant post-pandemic trend was observed ($Exp\beta = 0.997$; 95% CI, 0.989–1.006; $p = 0.520$). (Table 4)

Table 1. Participants characteristics[a].

Characteristics	Total		Pre-pandemic[b]		Post-pandemic[b]		p
	n = 9,821,803		n = 6,243,936		n = 3,577,867		
Sex (N, %)							
Male	3,017,562	(30.7)	1,907,541	(30.6)	1,110,021	(31.0)	<0.001
Female	6,804,241	(69.3)	4,336,395	(69.4)	2,467,846	(69.0)	
Age, years (mean, SD)	79.9	±8.0	79.6	±8.0	80.5	±7.9	<0.001
Residential area (N, %)							
Capital	1,416,673	(14.4)	906,929	(14.5)	509,744	(14.2)	<0.001
Metropolitans	1,971,578	(20.1)	1,251,784	(20.0)	719,794	(20.1)	
Urban	4,574,899	(46.6)	2,898,877	(46.4)	1,676,022	(46.8)	
Rural	1,858,653	(18.9)	1,186,346	(19.0)	672,307	(18.8)	
Household income, quintiles (N, %)							
1st (lowest)	2,862,170	(29.1)	1,795,816	(28.8)	1,066,354	(29.8)	<0.001
2nd	848,290	(8.6)	527,976	(8.5)	320,314	(9.0)	
3rd	1,134,551	(11.6)	706,929	(11.3)	427,622	(12.0)	
4th	1,119,215	(11.4)	730,087	(11.7)	389,128	(10.9)	
5th (highest)	3,857,577	(39.3)	2,483,128	(39.8)	1,374,449	(38.4)	
Health insurance type (N, %)							
Local subscriber	2,662,004	(27.1)	1,631,156	(26.1)	1,030,848	(28.8)	<0.001
Employee-based	5,808,578	(59.1)	3,744,847	(60.0)	2,063,731	(57.7)	
Medical aid program	1,351,221	(13.8)	867,933	(13.9)	483,288	(13.5)	
Registered disability (N, %)							
Yes	7,208,033	(73.4)	4,597,115	(73.6)	2,610,918	(73.0)	<0.001
No	2,613,770	(26.6)	1,646,821	(26.4)	966,949	(27.0)	
CCI (N, %)							
0–1	3,745,485	(38.1)	2,300,047	(36.8)	1,445,438	(40.4)	<0.001
2	2,621,814	(26.7)	1,685,873	(27.0)	935,941	(26.2)	
3 or over	3,454,504	(35.2)	2,258,016	(36.2)	1,196,488	(33.4)	
Years after dementia diagnosis (N, %)							
< 1	2,307,090	(23.5)	1,580,664	(25.3)	726,426	(20.3)	<0.001
1–4	4,874,860	(49.6)	3,108,368	(49.8)	1,766,492	(49.4)	
5 or over	2,639,853	(26.9)	1,554,904	(24.9)	1,084,949	(30.3)	

CCI: Charlson Comorbidity Index

[a]The numbers represent observations from study participants at 3-month intervals.

[b]The pre- and post-pandemic period were defined as February 1, 2016, through January 31, 2020 and February 1, 2020 through October 31, 2021

Sensitivity analyses using alternative dementia definitions, intervention timings, and negative binomial models yielded results that were directionally consistent with the primary analysis; however, under negative binomial assumptions, the post-pandemic slope increase in prescription duration was more modest, corresponding to a 1.2% increase per 3-month interval (Expβ = 1.012; 95% CI, 1.011–1.014) (Supplemental Tables 3–5).

In the supplementary analysis, healthcare utilization among patients with dementia declined immediately after the onset of the COVID-19 pandemic, with outpatient visits decreasing by 13.6% (Expβ = 0.864; 95% CI, 0.861–0.865; $p < 0.001$) and hospital admissions by 13.0% (Expβ = 0.870; 95% CI, 0.865–0.875; $p < 0.001$). Both measures subsequently demonstrated a gradual recovery over time, with increases per 3-month interval of 2.0% for outpatient visits (Expβ = 1.020; 95% CI, 1.019–1.020; $p < 0.001$) and 0.9% for hospital admission (Expβ = 1.009; 95% CI, 1.007–1.010; $p < 0.001$) (Supplemental Table 6).

Discussion

This nationwide study examined the association between the COVID-19 pandemic and antipsychotic prescribing trends among patients with dementia aged ≥60 years in South Korea using an ITS analysis. After the onset of the pandemic, significant upward trends were observed across all prescribing outcomes, including prescribing likelihood, duration, and number, indicating a broad intensification of antipsychotic use at the population level. Because these measures share a common denominator comprising all patients with dementia, the observed increases likely reflect a higher volume of patients receiving antipsychotic treatment and potentially greater overall treatment exposure at the population level, rather than a single shift in either treatment initiation or treatment persistence alone. Notably, prescribing likelihood declined briefly during the initial three months of the pandemic but subsequently increased and remained elevated over time.

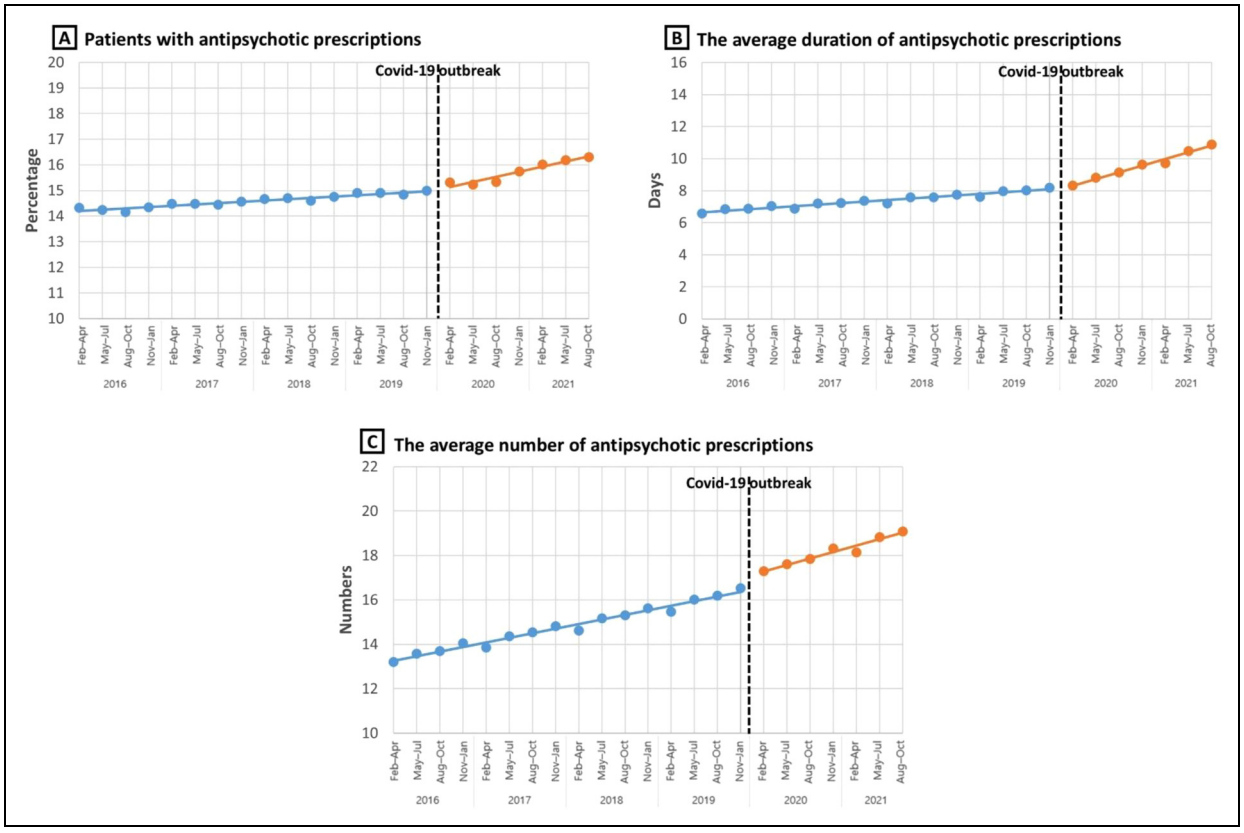

Figure 1. Results of interrupted time series analyses for changes in antipsychotic prescriptions among patients with dementia.

The sustained increase in antipsychotic prescribing observed after the initial phase of the pandemic may reflect multiple, non-mutually exclusive mechanisms. Prolonged social restrictions and reduced in-person support likely posed substantial challenges in managing BPSD.[24] During the pandemic, community dementia centers in South Korea suspended educational and social programs, while healthcare resources were redirected toward infection control.[3,19,20] Specifically, group-based daytime care (shelters), cognitive enhancement classes, in-person screening, and case management services were curtailed or shifted to limited non-face-to-face formats in accordance with national infection control guidance.[35] Reduced access to non-pharmacological interventions may have limited practical options for clinicians and caregivers to manage agitation, psychosis, or aggression, thereby increasing reliance on pharmacologic management.[24] These contextual factors are also consistent with international observations of increased psychotropic use among older adults during periods of restricted in-person care.[27]

Alternative explanations should also be considered. Progression of dementia severity over time and shifts in institutional prescribing practices may have contributed to the observed trends. However, although the post-pandemic period was characterized by modest increases in patient age and dementia duration reflecting cohort aging, the observed changes in antipsychotic prescribing persisted after adjustment for age, years since dementia diagnosis, and other demographic and clinical factors. Moreover, these changes were evaluated relative to pre-existing temporal trends using an interrupted time series design, supporting an association with pandemic-related disruptions rather than natural disease progression alone.

The short-term decline in prescriptions observed shortly after the pandemic onset likely stemmed from limited healthcare access and patient avoidance of medical facilities during early containment phases, consistent with global trends.[36–38] Supplementary analyses showed an immediate decline in in healthcare utilization following the pandemic onset. Notably, the concurrent decline in hospital admissions may suggest that some patients with severe dementia-related symptoms who would otherwise have required inpatient care were managed in community or long-term care settings without timely access to specialized services. As the pandemic persisted, medical access in outpatient settings gradually recovered through adaptations such as telemedicine and remote clinical contact, whereas non-pharmacological and social support services may not have recovered to the same extent; in this context,

Table 2. Results of ITS analysis for antipsychotic prescriptions.[a]

Variables	Exp(β)	95% CI	p
Antipsychotic prescriptions			
A. Likelihood of prescription			
Baseline trend	1.000	(0.999–1.001)	0.496
Level change after pandemic	0.973	(0.967–0.979)	<0.001
Slope change after pandemic	1.015	(1.013–1.017)	<0.001
Follow-up outcome trend	1.015	(1.014–1.017)	<0.001
B. Duration of prescriptions			
Baseline trend	1.011	(1.010–1.013)	<0.001
Level change after pandemic	0.982	(0.976–0.987)	<0.001
Slope change after pandemic	1.032	(1.029–1.034)	<0.001
Follow-up outcome trend	1.055	(1.052–1.057)	<0.001
C. Numbers of prescriptions			
Baseline trend	1.011	(1.010–1.012)	<0.001
Level change after pandemic	1.027	(1.019–1.034)	<0.001
Slope change after pandemic	1.004	(1.002–1.006)	0.001
Follow-up outcome trend	1.015	(1.013–1.017)	<0.001

ITS: Interrupted Time Series
[a]The pre- and post-pandemic period were defined as February 1, 2016, through January 31, 2020 and February 1, 2020 through October 31, 2021

Table 3. The association between the stringency of public measures, the elapsed time after pandemic, and the antipsychotic prescriptions.[a]

Variables	Exp(β)	95% CI	p
Patients with antipsychotic prescriptions			
A. The COVID-19 stringency index[b]			
Baseline outcome trend	1.004	(1.004–1.005)	<0.001
Stringency index (rescaled)	0.999	(0.998–0.999)	<0.001
B. Elapsed time after COVID-19 pandemic			
Baseline outcome trend	1.000	(0.999–1.001)	0.668
1–3 months	0.984	(0.978–0.991)	<0.001
4–6 months	1.038	(1.030–1.046)	<0.001
7–9 months	1.046	(1.036–1.055)	<0.001
10–12 months	1.041	(1.031–1.046)	<0.001
13–15 months	1.060	(1.048–1.073)	<0.001
16–18 months	1.073	(1.060–1.086)	<0.001
19–21 months	1.089	(1.075–1.103)	<0.001

COVID-19: Coronavirus disease-19
[a]The pre- and post-pandemic period were defined as February 1, 2016, through January 31, 2020 and February 1, 2020 through October 31, 2021
[b]The COVID-19 stringency index was rescaled to 5-point increments

accumulating caregiver burden and the continued lack of structured psychosocial interventions may have shifted clinical decision-making toward compensatory pharmacologic prescribing as behavioral symptoms accumulated over time.

In inpatient settings, prescribing patterns appeared to differ. Although the likelihood of hospital admission itself declined during the early phase of the pandemic, patients who remained hospitalized continued to have access to medical care, allowing pharmacologic treatment to be initiated when acute behavioral symptoms emerged. Reduced in-person visitation and constrained social support within inpatient settings may have further contributed to an early post-pandemic increase in antipsychotic prescribing among hospitalized patients. The subsequent decline may reflect heightened awareness and policy-level efforts to limit inappropriate antipsychotic use in institutional settings.[14] However, these findings should be interpreted with caution, as the wider confidence interval for the immediate inpatient level change likely reflects lower statistical precision due to the smaller number of hospitalized patients relative to outpatients.

Table 4. The association between the antipsychotic prescriptions and COVID-19 pandemic in outpatient and inpatient settings.[a]

Variables	Exp(β)	95% CI	p
Patients with antipsychotics prescriptions			
A. Outpatient setting			
Baseline trend	1.001	(1.000 - 1.002)	0.049
Level change after pandemic	0.970	(0.964 - 0.976)	<0.001
Slope change after pandemic	1.017	(1.015 - 1.019)	<0.001
Follow-up outcome trend	1.018	(1.017–1.020)	<0.001
B. Inpatient setting			
Baseline trend	1.008	(1.005–1.010)	<0.001
Level change after pandemic	1.046	(1.003–1.090)	0.036
Slope change after pandemic	0.990	(0.981–0.999)	0.027
Follow-up outcome trend	0.997	(0.989–1.006)	0.520

COVID-19: Coronavirus disease-19
[a]The pre- and post-pandemic period were defined as February 1, 2016, through January 31, 2020 and February 1, 2020 through October 31, 2021

Overall, changes in antipsychotic prescribing appeared to be more strongly associated with the duration of the pandemic than with the stringency of containment policies. Although the government stringency index was statistically associated with prescribing, the magnitude of this association was minimal and unlikely to be clinically meaningful. Cumulative psychological burden and prolonged social isolation, compounded by sustained disruptions in routine dementia care, may exert effects that intensify over time. Such long-term stressors are likely more directly relevant to dementia-related symptom burden and caregiving demands than short-term policy fluctuations, thereby providing a more plausible explanation for observed prescribing patterns than contemporaneous policy intensity. Furthermore, the Korean context adds an additional layer of complexity. Prior experience with the 2015 Middle East respiratory syndrome epidemic may have contributed

to heightened risk perception and sustained voluntary behavioral changes that persisted regardless of official mandates.[39] Consequently, the government stringency index may have underrepresented real-world reductions in social contact and care-related behaviors.

These findings are partly consistent with international studies reporting heterogeneous outcomes regarding antipsychotic use among patients with dementia during the pandemic. Research from Germany, the United Kingdom, France, and Wales documented divergent changes in antipsychotic prescribing, which may reflect differences in long-term care versus community-dwelling populations, prescribing practices, healthcare system organization, and coding or measurement practices across countries.[16] South Korea's relatively high healthcare accessibility for older adults may have functioned as both a strength and a potential risk during the pandemic. While maintained access to medical services may have enabled timely symptom management when community-based and non-pharmacological care was disrupted, it may also have lowered barriers to pharmacologic treatment in the absence of adequate psychosocial support. Achieving an appropriate ethical balance may therefore require integrating deprescribing systems and non-pharmacological care into crisis-response frameworks, so that healthcare accessibility does not inadvertently compromise prescribing quality.

The consistency of findings across sensitivity analyses using alternative operational definitions of dementia and different intervention points supports the robustness of the main findings. When negative binomial models were applied, the post-pandemic slope increase for antipsychotic prescription duration showed an attenuated magnitude, while remaining directionally consistent and statistically significant.

Although this study did not establish causality, the findings highlight the need for sustained access to behavioral and psychosocial care for patients with dementia during public health crises, particularly in outpatient settings where care disruptions may delay symptom management. Given the well-documented safety risks associated with prolonged or inappropriate antipsychotic use in this population, reinforcing non-pharmacological and caregiver-based strategies remains essential. In practice, coordinated efforts by government agencies, healthcare providers, and community dementia centers to sustain non-pharmacological care, expand clinician-supported telehealth, and strengthen caregiver education may help mitigate reliance on pharmacologic management during future emergencies.

This study offers several methodological strengths. It represents one of the largest nationwide analyses to date, using individual-level longitudinal data from more than 870,000 patients and 9.8 million person-observations. The use of a large, nationally representative health insurance database enhanced external validity and minimized selection bias. The ITS design enabled assessment of both immediate and gradual shifts in prescribing behavior while accounting for pre-existing trends, patient-level covariates, and seasonal variation (parameterized using indicator variables aligned with the 3-month analytic intervals). Moreover, the individual-level ITS approach reduces the risk of ecological bias compared with aggregate-level ITS analyses by modeling within-person changes over time.

However, this study has several limitations. First, the claims-based dataset lacked detailed clinical information—such as cognitive function, BPSD severity, and the caregiving environment—as well as COVID-19-related factors (e.g., infection status, severity, and vaccination). Consequently, we could not determine whether the observed prescribing shifts reflected actual symptom burden and clinical outcomes or changes in institutional culture and prescribing practices. Future studies using more clinically detailed data will be needed to disentangle symptom-level mechanisms from changes in prescribing practices. Second, the analysis focused on medication use rather than patient-level clinical outcomes; thus, the effects of changes in prescribing on patient safety and disease progression could not be evaluated. Third, patients continuously admitted to long-term care hospitals (LTCHs) were excluded because prescription data were unavailable. Individuals residing in LTCHs typically have more advanced disease severity and higher care needs, and antipsychotic use in these settings may have been more pronounced, particularly under pandemic-related restrictions. Exclusion of this population may therefore have led to underestimation of the magnitude of prescribing changes, biasing the results toward the null. Fourth, the post-pandemic period comprised a relatively limited number of time intervals, and more recent data were not available. Although the observed positive post-pandemic slope suggests that increased antipsychotic use persisted throughout the available follow-up period rather than representing a transient spike, longer observation would be required to determine whether prescribing patterns eventually stabilized or declined; however, the ITS framework primarily relies on stable pre-intervention trends, and findings were consistent across sensitivity analyses. Fifth, although prescribing patterns may differ by dementia subtype, this study did not specifically examine subtype-level differences. Finally, despite adjustment for measurable confounders and temporal factors, unobserved variables such as education level, socioeconomic stress, regional outbreak severity, physician-level factors (e.g., psychiatrist versus primary care physician), and facility-level prescribing protocols or institutional norms may have influenced the results.

Conclusion

In conclusion, this nationwide ITS analysis identified an association between the COVID-19 pandemic and changes

in antipsychotic prescribing among patients with dementia in South Korea. The observed patterns are consistent with increased reliance on pharmacologic management in the context of prolonged social restrictions and disrupted dementia care. Maintaining non-pharmacological and community-based dementia care, alongside caregiver support and telehealth-enabled clinical follow-up, may be important for promoting balanced and safe dementia management during future public health emergencies.

ORCID iD

Kyungduk Hurh https://orcid.org/0000-0002-8295-7767

Ethical considerations

This study was reviewed and approved by the Institutional Review Board of Yonsei University Health System in accordance with the principles of the Declaration of Helsinki (IRB no. 4-2022-1394). Because the National Health Insurance Database (NHID) used in this study does not contain personally identifiable information, the requirement for informed consent was waived.

Author contribution(s)

Kyungduk Hurh: Conceptualization; Data curation; Formal analysis; Investigation; Methodology; Writing – original draft; Writing – review & editing.

Hyunkyu Kim: Conceptualization; Data curation; Formal analysis; Project administration; Supervision; Writing – review & editing.

Eun-Cheol Park: Project administration; Supervision; Writing – review & editing.

Funding

This work was supported by the Gachon University research fund of 2025 [grant number GCU-202502690001]. The funder had no role in the design and conduct of the study; collection, management, analysis, and interpretation of the data; preparation, review, or approval of the manuscript; and decision to submit the manuscript for publication.

Declaration of conflicting interests

The authors declared no potential conflicts of interest with respect to the research, authorship, and/or publication of this article.

Data availability statement

The datasets generated and/or analyzed during the current study are not publicly available because access to NHIS data is restricted to authorized users within designated secure research facilities.

Supplemental material

Supplemental material for this article is available online.

References

1. Statistics Korea. Senior statistics 2022, https://kostat.go.kr/board.es?mid=a10301060500&bid=10820&act=view&list_no=420896&tag=&nPage=1&ref_bid= (accessed 5 October 2023).
2. United Nations Economic and Social Commission for Asia and the Pacific. *Asia-Pacific report on population ageing 2022: trends, policies and good practices regarding older persons and population ageing*. Bangkok: UN ESCAP, 2022.
3. National Institute of Dementia. *National dementia epidemiological surveillance in Korea 2023*. Seoul: National Institute of Dementia, 2023. https://www.nid.or.kr/info/dataroom_view.aspx?bid=309 (accessed 30 January 2026). Korean language document.
4. Bessey LJ and Walaszek A. Management of behavioral and psychological symptoms of dementia. *Curr Psychiatry Rep* 2019; 21: 1–11.
5. Black W and Almeida OP. A systematic review of the association between the behavioral and psychological symptoms of dementia and burden of care. *Int Psychogeriatr* 2004; 16: 295–315.
6. Kales HC, Gitlin LN and Lyketsos CG. Assessment and management of behavioral and psychological symptoms of dementia. *Br Med J* 2015; 350: h369.
7. Reus VI, Fochtmann LJ, Eyler AE, et al. The American Psychiatric Association practice guideline on the use of antipsychotics to treat agitation or psychosis in patients with dementia. *Am J Psychiatry* 2016; 173: 543–546.
8. Huybrechts KF, Gerhard T, Crystal S, et al. Differential risk of death in older residents in nursing homes prescribed specific antipsychotic drugs: population-based cohort study. *Br Med J* 2012; 344: e997.
9. Maust DT, Kim HM, Seyfried LS, et al. Antipsychotics, other psychotropics, and the risk of death in patients with dementia: number needed to harm. *JAMA Psychiatry* 2015; 72: 438–445.
10. Schneider LS, Dagerman KS and Insel P. Risk of death with atypical antipsychotic drug treatment for dementia: meta-analysis of randomized placebo-controlled trials. *JAMA* 2005; 294: 1934–1943.
11. Douglas IJ and Smeeth L. Exposure to antipsychotics and risk of stroke: self controlled case series study. *Br Med J* 2008; 337: a1227.
12. Gill SS, Rochon PA, Herrmann N, et al. Atypical antipsychotic drugs and risk of ischaemic stroke: population based retrospective cohort study. *Br Med J* 2005; 330: 445.
13. Lenzer J. FDA Warns about using antipsychotic drugs for dementia. *Br Med J* 2005; 330: 922.
14. Health Insurance Review and Assessment Service. *Guideline for the use of antipsychotic medications in hospitalized older patients in long-term care hospitals*. Wonju, Republic of Korea: HIRA, 2021. Korean language document.
15. You J. Lessons from South Korea's COVID-19 policy response. *Am Rev Public Adm* 2020; 50: 801–808.
16. Choi H, Lim J-S, Lee C-N, et al. Coronavirus disease 2019 and dementia: the survey for dementia patients in COVID-19 crisis. *Dement Neurocogn Disord* 2021; 20: 16.
17. Lee S. The Operational Status and Policy Challenges of the Dementia Care Center, https://www.kihasa.re.kr/publish/

regular/hsw/view?seq=49488&volume=49482 (accessed 25 September 2023). Korean language document.
18. Soysal P, Smith L, Trott M, et al. The effects of COVID-19 lockdown on neuropsychiatric symptoms in patients with dementia or mild cognitive impairment: a systematic review and meta-analysis. *Psychogeriatrics* 2022; 22: 402–412.
19. Lim J-S, Shim YS, Lee C-N, et al. Coronavirus disease 2019 and dementia: recommendation of the Korean Dementia Association. *Dement Neurocogn Disord* 2020; 19: 125.
20. Ministry of Health and Welfare (MOHW). From May 2, nationwide Dementia Relief Centers to resume normal operations: prior reduction of in-person programs during COVID-19. Sejong, Republic of Korea, 2022. Korean language document.
21. Beach B, Steptoe A and Zaninotto P. Depression and anxiety in people with cognitive impairment and dementia during the COVID-19 pandemic: analysis of the English longitudinal study of ageing. *PLoS Med* 2023; 20: e1004162.
22. Guterman EL. Addressing vulnerability and dementia in the era of COVID-19. *JAMA Neurol* 2022; 79: 327–328.
23. LeVasseur AL. Effects of social isolation on a long-term care resident with dementia and depression during the COVID-19 pandemic. *Geriatr Nurs* 2021; 42: 780–781.
24. Manca R, De Marco M and Venneri A. The impact of COVID-19 infection and enforced prolonged social isolation on neuropsychiatric symptoms in older adults with and without dementia: a review. *Front Psychiatry* 2020; 11: 585540.
25. Gedde MH, Husebo BS, Vahia IV, et al. Impact of COVID-19 restrictions on behavioural and psychological symptoms in home-dwelling people with dementia: a prospective cohort study (PAN. DEM). *BMJ Open* 2022; 12: e050628.
26. Wei G, Diehl-Schmid J, Matias-Guiu J, et al. The effects of the COVID-19 pandemic on neuropsychiatric symptoms in dementia and carer mental health: an international multicentre study. *Sci Rep* 2022; 12: 2418.
27. Luo H, Lau WC, Chai Y, et al. Rates of antipsychotic drug prescribing among people living with dementia during the COVID-19 pandemic. *JAMA Psychiatry* 2023; 80: 211–219.
28. Schnier C, McCarthy A, Morales DR, et al. Antipsychotic drug prescribing and mortality in people with dementia before and during the COVID-19 pandemic: a retrospective cohort study in Wales, UK. *Lancet Healthy Longev* 2023; 4: e421–e430.
29. Cheol Seong S, Kim Y-Y, Khang Y-H, et al. Data resource profile: the national health information database of the National Health Insurance Service in South Korea. *Int J Epidemiol* 2017; 46: 799–800.
30. Ministry of Health and Welfare. COVID-19: changes in infectious disease response over the past three years, https://www.mohw.go.kr/board.es?mid=a10503010100&bid=0027&tag=&act=view&list_no=374685&cg_code= (accessed 25 November 2023). Korean language document.
31. Jang S-Y, Rou WS, Kim SH, et al. Association between new-onset liver cirrhosis and suicide risk in South Korea: a nationwide cohort study. *Clin Mol Hepatol* 2020; 27: 283.
32. Quan H, Sundararajan V, Halfon P, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005; 43: 1130–1139.
33. Wagner AK, Soumerai SB, Zhang F, et al. Segmented regression analysis of interrupted time series studies in medication use research. *Clin Pharm Ther* 2002; 27: 299–309.
34. Hale T, Angrist N, Goldszmidt R, et al. A global panel database of pandemic policies (Oxford COVID-19 Government Response Tracker). *Nat Hum Behav* 2021; 5: 529–538.
35. Ministry of Health and Welfare (MOHW). COVID-19 response and operational status of community dementia centers: site visit to the National Institute of Dementia and provincial coordination meeting. Press release. Sejong, Republic of Korea, January 18, 2021. Korean language document.
36. Bronskill SE, Maclagan LC, Maxwell CJ, et al. Trends in health service use for Canadian adults with dementia and Parkinson disease during the first wave of the COVID-19 pandemic. *JAMA Health Forum* 2022; 3: e214599.
37. Lee M and You M. Avoidance of healthcare utilization in South Korea during the coronavirus disease 2019 (COVID-19) pandemic. *Int J Environ Res Public Health* 2021; 18: 4363.
38. Park K, Byeon J, Yang Y, et al. Healthcare utilisation for elderly people at the onset of the COVID-19 pandemic in South Korea. *BMC Geriatr* 2022; 22: 395.
39. Kim K, Tandi T, Choi JW, et al. Middle East Respiratory syndrome coronavirus (MERS-CoV) outbreak in South Korea, 2015: epidemiology, characteristics and public health implications. *J Hosp Infect* 2017; 95: 207–213.