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Atrial fibrillation fact sheet in Korea 2024 (part 3): treatment for atrial fibrillation in Korea: medicines and ablation

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Abstract

Background Atrial fibrillation (AF) is a prevalent cardiac arrhythmia associated with significant morbidity and mortality, posing a considerable burden on healthcare systems. In Republic of Korea, the prevalence and incidence of AF have increased in recent years. There have also been significant changes in the trends of antiarrhythmic drug (AAD) use and procedural treatments for AF.

Objectives This study aims to review the trends in AF treatment strategies in Republic of Korea, particularly focusing on the utilization of antiarrhythmic drugs and catheter ablation.

Methods The Korean National Health Insurance Service (K-NHIS) data were used to identify AF patients from 2013 to 2022. AAD usage and catheter ablation procedures were analyzed annually. AADs were classified into Class IC and III drugs. Trends in beta-blockers, calcium channel blockers, and digoxin prescriptions were also examined. The primary endpoint was the trend of AAD use and AF catheter ablation (AFCA) over 10 years.

Results In 2022, 940,063 patients had a prior diagnosis of AF. From 2013 to 2022, the use of AADs increased from 12.1 to 16.4% among prevalent AF patients. Beta-blockers were the most commonly prescribed rate control medication, while the use of calcium channel blockers and digoxin declined. The frequency of AFCA procedures also increased, from 0.5% of prevalent AF patients in 2013 to 0.7% in 2022. Younger patients, males, and those with lower CHA_2DS_2-VASc scores were more likely to receive AFCA. Regional variations in treatment patterns were observed, with Seoul exhibiting higher rates of procedural treatments and AAD prescriptions.

Conclusions Over the past decade, there has been a significant increase in the use of AADs and AFCA procedures in Republic of Korea. These trends reflect recent advancements in AF management advocating a refined rhythm control strategy.

Keywords Atrial fibrillation, Antiarrhythmic drugs, Catheter ablation

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Introduction

Atrial fibrillation (AF) is a prevalent cardiac arrhythmia associated with significant morbidity and mortality 1. It poses a considerable burden on healthcare systems, due to its high incidence, potential complications such as stroke and heart failure, and the associated healthcare costs 2. In Republic of Korea, the prevalence and incidence of AF has increased gradually over the last several years 3. Recently, there have been significant advancements in the field of AF management, including the development of novel antiarrhythmic agents, the diversification of procedural therapies such as cryoballoon catheter ablation, and their adoption within the domestic medical landscape [4, 5]. Moreover, the issuance of Korean guidelines for AF management and the sustained efforts of Korean Heat Rhythm society in providing continuous education have contributed to an increased awareness and interest in AF management [6, 7]. Furthermore, there has been a qualitative and quantitative expansion in the availability of specialized arrhythmia physicians and centers in Republic of Korea. Notably, this has led to an increasing interest in utilizing domestic data to analyze and summarize the trends in AF treatment strategies, particularly in the utilization of antiarrhythmic drugs and catheter ablation. In this paper, we aim to review the trend of AF management in Korea, drawing insights from domestic data to assess the evolving landscape of utilization of antiarrhythmic drugs and catheter ablation.

Methods

Study cohort

The Korean National Health Insurance Service (K-NHIS) system was used to perform this study. The Korean government manages the K-NHIS system which is an exclusive medical insurance system of the nation. All citizens are mandatory subscribers of the K-NHIS which stores prescription history of drugs (including AADs) and reports of International Classification of Diseases, 10th edition (ICD-10) diagnostic codes (including that for AF) throughout the entire nation. All catheter ablation procedures performed in Republic of Korea are mandatorily reported to the K-NHIS system to gain reimbursement. Therefore, performance of catheter ablation is clearly identifiable through the K-NHIS database.

Medical researchers can gain access to the data stored in the K-NHIS database under approval from both the official K-NHIS review committee (https://nhiss.nhis.or.kr/) and the local Institutional Review Board. The Institutional Review Board of Seoul National University Hospital and the official review committee of the K-NHIS both approved this specific study. Legal regulations of Republic of Korea and the ethical guidelines of the 2013 Declaration of Helsinki was strictly adhered throughout the study.

Consent to participate declaration

The Institutional Review Board of Seoul National University Hospital waived the requirement for written informed consent because this study was based on retrospective analysis.

Diagnosis of AF

We searched reports of ICD-10 codes for AF (I48.0, I48.1, I48.2, and I48.9; Supplementary Table S1) from outpatient clinic and inpatient admissions. Two reports from outpatient clinic or a single report from inpatient admission were required to diagnosis AF. We screened individuals diagnosed with AF between January 1, 2002, and December 31, 2022. Prevalent AF was defined as people who had a report of ICD-10 codes for AF at any moment prior to index date. Incident AF (new-onset AF) was defined as first report of ICD-10 codes for AF in a person who had no prior report of such ICD-10 codes.

Prescription of antiarrhythmic drug

Antiarrhythmic drugs were classified into Class IC and III drugs. Class IC included flecainide, propafenone, and pilsicainide. Amiodarone, dronedarone, and sotalol were classified as Class III drugs. Patients who were prescribed with AADs for longer than 30 days for a given year were classified as AAD users for that specific year. This process was performed for each year starting from 2013 to 2022. Drug prescription history was analyzed for whole AADs in addition to Class IC and III drugs separately.

Catheter ablation

Total number of AFCA performed among prevalent AF patients for each year starting from 2013 to 2022 was evaluated. Both radiofrequency- and cryo-ablation was evaluated. No pulsed-field-ablation was performed in Republic of Korea during study period. Only de-novo procedures were counted. Cryo-ablation was introduced in June, 2018. Early-AFCA was defined as AFCA performed within one year of AF diagnosis. Total number of incident AF patients who underwent early-AFCA was counted for each year starting from 2013 to 2021. Since we do not have follow-up data of year 2023, number of incident AF patients undergoing early-AFCA could not be evaluated.

Primary outcome endpoint

The aim of this study is to describe 10-year trend of AAD use and performance of AFCA in Republic of Korea. The data between 2013 and 2022 were collected. Prescription and procedure codes for each drug and procedure are

summarized in Supplementary Tables S2 and S3, respectively. Outcomes were reported as both absolute numbers and their percentile values.

No uncensored losses to follow-up exist in this study due to nature the K-NHIS database. Annual entrance and exit in our cohort include newly diagnosed AF, immigrations, emigrations, and death.

Definitions

Reported ICD-10 codes were used to evaluate baseline demographics. Supplementary Table S4 summarizes the ICD-10 codes used in this study to identify hypertension, diabetes mellitus, heart failure, ischemic stroke, transient ischemic attack, myocardial infarction, and peripheral artery disease. Single report of ICD-10 codes at either outpatient clinic or inpatient admission was required for diagnosis. However, only reports during inpatient admission were counted for diagnosis of heart failure.

Statistical analysis

Continuous variables were expressed as mean ± standard deviation. Categorical variables were expressed as numbers and their percentile value. Continuous and categorical variables were compared with Student's t test and chi-square test, respectively. All tests were two-tailed, with p values ≤ 0.05 indicating statistical significance. SAS version 9.4 (SAS Institute, Cary, NC, USA) was used for all statistical analyses.

Data availability declaration

The underlying data of this study cannot be opened to public since the K-NHIS possess the data and legally prohibits data sharing.

Results

Patients

In 2022, a total of 940,063 patients had prior diagnosis of AF (prevalent AF) and their demographics are summarized in Table 1. The average age of these patients was 70.3 ± 14.1 years, with males constituting 54.9% of the population. The median CHA_2DS_2-VASc score was 4. Comorbid conditions were observed in the following order: hypertension (80.5%), diabetes (31.5%), heart failure (27.6%), ischemic stroke (20.9%), and vascular disease (15.8%). Between 2013 and 2022, 939,057 patients were newly diagnosed with AF (incident AF). The average age in this group was 68.9 ± 14.8 years, with males making up 54.1% of the cohort (Table 2). The median CHA_2DS_2-VASc score was 3. Prevalence of comorbidities were as follows: hypertension (80.3%), diabetes (29.6%), heart failure (29.0%), ischemic stroke (19.4%), and vascular disease (17.0%).

Trend of AF treatment

Of the patients diagnosed with prevalent AF, 32.2% (303,067/940,063) received pharmacological treatment with AADs, while 3.5% (32,848/940,063) underwent AFCA. Patients who received procedural treatment were younger, had a higher proportion of males, and presented with lower CHA_2DS_2-VASc scores compared to those who received pharmacological treatment. Among newly diagnosed AF patients, 17.7% received pharmacological treatment with AADs, and 0.8% underwent AFCA within one year after diagnosis. Those who received AFCA had a higher proportion of male sex and were younger. Prevalence of various medical comorbidities were lower.

Medical treatment of AF

During the study period, beta blockers were the most commonly prescribed medication for rate control, with their prescription rate increasing annually. In 2022, beta blockers were prescribed to 46.6% of prevalent AF patients. Conversely, the utilization rates of calcium channel blockers and digoxin showed a decreasing trend (Fig. 1).

From 2013 to 2022, the utilization of AADs for rhythm control in AF patients gradually increased (Fig. 2). In 2013, 12.1% of prevalent AF patients were prescribed AADs, which rose to 16.4% by 2022. Throughout the study period, the use of Class IC drugs was more prevalent than Class III drugs. A similar trend was observed among newly diagnosed AF patients (Fig. 3).

Catheter ablation for AF

The frequency of AFCA has gradually increased, from 0.5% of prevalent AF patients in 2013 to 0.7% in 2022 (Fig. 4). In 2022, 6652, 4682, and 1990 patients underwent AFCA, RFCA, and cryo-balloon ablation, respectively. The frequency of procedural treatment for newly diagnosed AF was higher than that for prevalent AF (Fig. 5). In 2021, 1.3% of patients underwent procedural treatment within 1 year of AF diagnosis. Following its introduction in 2018, the frequency of cryo-balloon ablation has been increasing. The use of RFCA showed a temporary decline with the emergence of cryo-balloon ablation but has been on the rise since 2019.

Regional variations

Based on 2022 data, the prescription rates of antiarrhythmic drugs and the frequency of procedural treatments vary by region. Seoul (19.2%) and Sejong city (19.7%) exhibit the highest rate of prescription of AADs. AFCA was most frequently performed in Seoul

Table 1 Baseline demographics of people with prevalent AF

	Prevalent AF	Prevalent AF patients who underwent AAD therapy	Prevalent AF patients who underwent AFCA
Total number	940,063	303,067	32,848
Age (years)	70.3 ± 14.1	66.5 ± 12.7	60.5 ± 10.3
< 65	285,694 (30.39%)	126,325 (41.68%)	20,808 (63.35%)
65–75	242,156 (25.76%)	88,759 (29.29%)	9488 (28.88%)
≥ 75	412,213 (43.85%)	87,983 (29.03%)	2552 (7.77%)
Sex			
Male	516,477 (54.94%)	183,226 (60.46%)	24,389 (74.25%)
Female	423,586 (45.06%)	119,841 (39.54%)	8459 (25.75%)
Comorbidities			
Hypertension	756,345 (80.46%)	259,631 (85.67%)	28,076 (85.47%)
Diabetes	295,798 (31.47%)	80,174 (26.45%)	6255 (19.04%)
Heart failure	259,598 (27.61%)	88,245 (29.12%)	12,055 (36.70%)
Ischemic stroke	196,544 (20.91%)	43,449 (14.34%)	3930 (11.96%)
Transient ischemic attack	20,050 (2.13%)	3925 (1.30%)	361 (1.10%)
Vascular disease composite	148,562 (15.80%)	47,023 (15.52%)	3681 (11.21%)
Myocardial infarction	104,144 (11.08%)	33,252 (10.97%)	2520 (7.67%)
Peripheral artery disease	52,102 (5.54%)	16,151 (5.33%)	1292 (3.93%)
CHA_2DS_2-VASc score			
Mean ± standard deviation	3.6 ± 2	3.1 ± 1.9	2.5 ± 1.5
Median [interquartile range]	4 [3]	3 [2]	2 [2]
0	42,825 (4.56%)	13,859 (4.57%)	1889 (5.75%)
1	112,088 (11.92%)	49,887 (16.46%)	7579 (23.07%)
2	141,957 (15.10%)	62,131 (20.50%)	9021 (27.46%)
3	169,210 (18.00%)	58,925 (19.44%)	6816 (20.75%)
4	174,928 (18.61%)	48,767 (16.09%)	4124 (12.55%)
5	133,659 (14.22%)	33,354 (11.01%)	2120 (6.45%)
6	89,069 (9.47%)	20,107 (6.63%)	863 (2.63%)
7	51,209 (5.45%)	10,486 (3.46%)	328 (1.00%)
8	21,023 (2.24%)	4558 (1.50%)	95 (0.29%)
9	4095 (0.44%)	993 (0.33%)	13 (0.04%)

AAD: antiarrhythmic drug; AF: atrial fibrillation; AFCA: atrial fibrillation catheter ablation

(1.2%) and Sejong city (1.4%). In contrast, Gyeongsangnam-do has the lowest drug prescription rate and AFCA performance rate.

Discussion

The current study demonstrated a 10-year trend of AAD use and performance of AFCA, based on data from 940,063 patients identified as diagnosed with AF in Republic of Korea from 2013 to 2022. The AF prevalence, the comorbidities, and CHA2DS2-VASc score of these AF patients are aligned with recent findings from Western populations [1, 8, 9]. Our study indicates that in Republic of Korea, the annual use of AADs and AFCA has consistently increased among both the overall and newly diagnosed AF populations.

Demographic influences on AF management

Our study revealed that patients who received procedural treatment with AFCA were predominantly younger, male, and presented with lower CHA_2DS_2-VASc scores, compared to those who received pharmacological treatment with AADs. The EAST-AFNET 4 trial demonstrated that early rhythm-control strategy significantly reduces the risk of cardiovascular death, stroke, and hospitalization for heart failure or acute coronary syndrome in patients with newly diagnosed atrial fibrillation, emphasizing the importance of prompt intervention 10. Similarly, a recent Korean cohort study corroborated these findings, showing that early rhythm-control significantly lowers adverse cardiovascular outcomes, confirming the consistency of these benefits across different populations 11. Our results align with recent guidelines advocating early rhythm control, particularly for younger AF patients with

Table 2 Baseline demographics of people with incident AF

	Incident AF	Incident AF patients who underwent AAD therapy	Incident AF patients who underwent AFCA
Total number	939,057	165,786	7101
Age (years)	68.9 ± 14.8	65.5 ± 12.9	58.2 ± 10.4
< 65	319,907 (34.07%)	74,543 (44.96%)	5114 (72.02%)
65–75	231,657 (24.67%)	47,365 (28.57%)	1660 (23.38%)
≥ 75	387,493 (41.26%)	43,878 (26.47%)	327 (4.60%)
Sex			
Male	507,881 (54.08%)	100,449 (60.59%)	5374 (75.68%)
Female	431,176 (45.92%)	65,337 (39.41%)	1727 (24.32%)
Comorbidities			
Hypertension	753,549 (80.25%)	136,223 (82.17%)	5264 (74.13%)
Diabetes	277,541 (29.56%)	40,344 (24.33%)	1137 (16.01%)
Heart failure	271,963 (28.96%)	43,826 (26.44%)	1250 (17.60%)
Ischemic stroke	182,462 (19.43%)	19,642 (11.85%)	631 (8.89%)
Transient ischemic attack	16,842 (1.79%)	1948 (1.18%)	57 (0.80%)
Vascular disease composite	159,139 (16.95%)	24,416 (14.73%)	665 (9.36%)
Myocardial infarction	112,861 (12.02%)	16,863 (10.17%)	403 (5.68%)
Peripheral artery disease	54,508 (5.80%)	8688 (5.24%)	278 (3.91%)
CHA_2DS_2-VASc score			
Mean ± standard deviation	3.5 ± 2.0	2.9 ± 1.8	1.9 ± 1.4
Median [interquartile range]	3 [3]	3 [2]	2 [2]
0	45,417 (4.84%)	9694 (5.85%)	903 (12.72%)
1	122,321 (13.03)	29,964 (18.07%)	2228 (31.38%)
2	148,972 (15.86%)	35,684 (21.52%)	1889 (26.60%)
3	165,659 (17.64%)	32,312 (19.49%)	1098 (15.46%)
4	167,950 (17.88%)	25,906 (15.63%)	643 (9.06%)
5	131,281 (13.98%)	16,555 (9.99%)	238 (3.35%)
6	86,698 (9.23%)	9264 (5.59%)	72 (1.01%)
7	47,975 (5.11%)	4406 (2.66%)	25 (0.35%)
8	19,121 (2.04%)	1651 (1.00%)	5 (0.07%)
9	3663 (0.39%)	350 (0.21%)	0 (0.00%)

AAD: antiarrhythmic drug; AF: atrial fibrillation; AFCA: atrial fibrillation catheter ablation

fewer comorbidities, highlighting a tailored management approach [12, 13]. The underrepresentation of women in procedural treatment of with catheter ablation may be attributed to their higher likelihood of presenting with persistent AF and atypical symptoms, which can delay both diagnosis and treatment compared with men 14. These factors potentially contribute to the observed disparity of sex differences in treatment modalities.

Evolving strategies in rhythm and rate control for AF

A gradual increase in the use of AADs for AF management was observed between 2013 and 2022, likely influenced by international guidelines from the mid-2010s advocating a rhythm control strategy [15, 16]. These guidelines have shaped clinical decision-making by providing specific recommendations for AAD selection tailored to comorbidities like heart failure, left ventricular hypertrophy, and coronary artery disease, enhancing AF management and leading to safer, more effective outcomes. According to the latest guidelines, AFCA has been elevated to a Class IA recommendation as a first-line therapy for rhythm control in selected patients—typically younger individuals with few comorbidities—who have symptomatic paroxysmal AF requiring rhythm control to improve symptoms and prevent progression to persistent AF 13. This recommendation reflects increasing confidence in the efficacy and safety of catheter ablation, as recent randomized controlled trials have demonstrated its superiority over pharmacological therapy [17–21]. Beta blockers and non-dihydropyridine

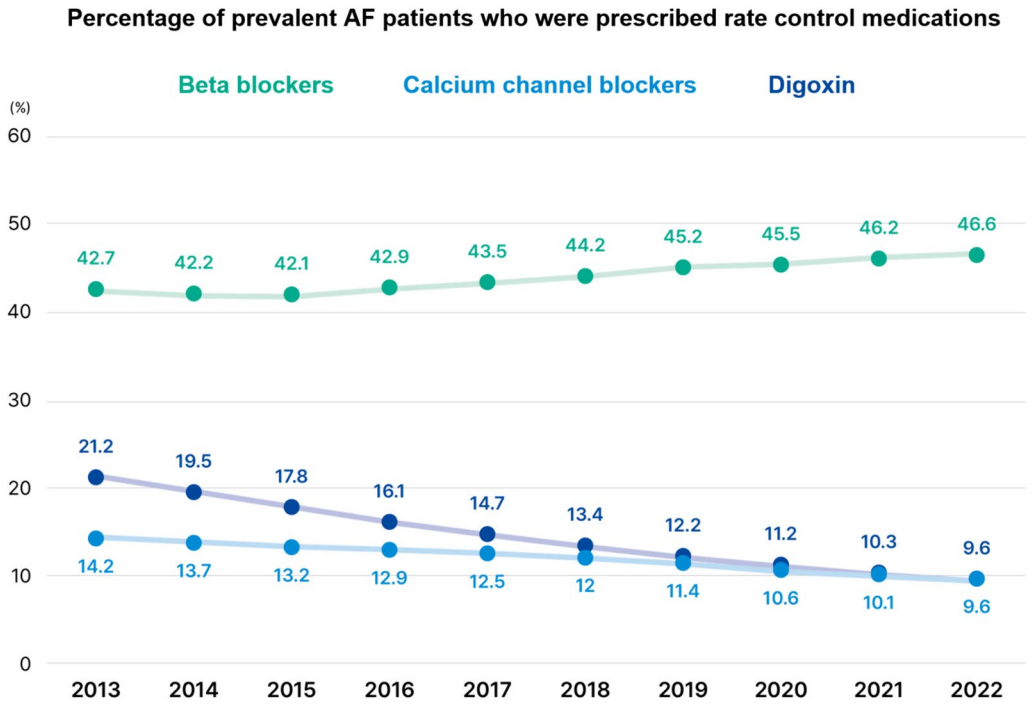

Fig. 1 Proportion of patients who underwent rate control therapy among prevalent AF patients. AF: atrial fibrillation

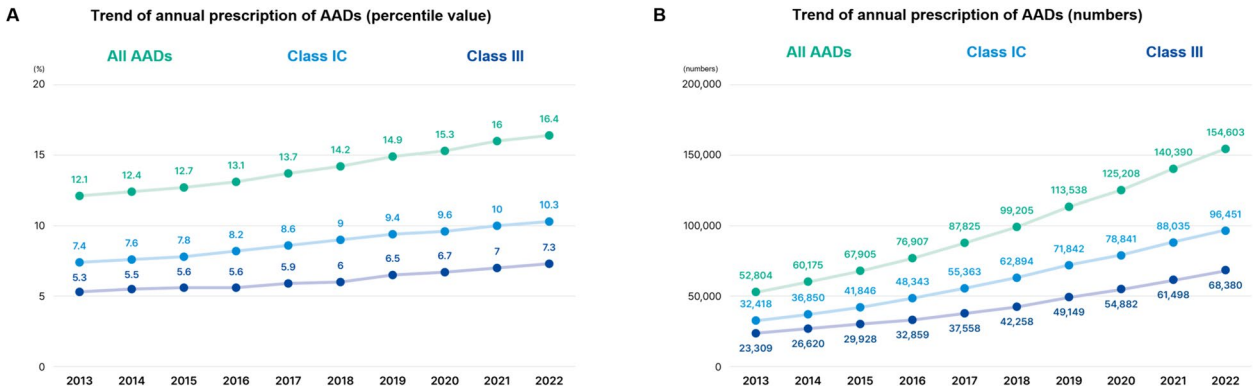

Fig. 2 Annual trend of number of patients who were prescribed with AADs among prevalent AF patients. AAD: antiarrhythmic drug; AF: atrial fibrillation

calcium channel blockers (NDCBs) are classified as Class I recommendations for rate control, except in heart failure patients with reduced ejection fraction (LVEF ≤ 40%), where NDCBs are contraindicated [12, 13]. Digoxin, classified as Class IIa recommendation, has declined in usage due to its association with increased mortality, particularly as monotherapy [22, 23]. These factors influenced trends in our data, where beta blockers were the most frequently prescribed rate control medication, with increasing annual prescription rates, while the use of calcium channel blockers and digoxin declined.

Trends in AFCA in republic of Korea

Our study revealed a consistent increase in the frequency of AFCA procedures in Republic of Korea, highlighting its growing significance as a treatment option. Not only in the overall population of patients with AF but also among those newly diagnosed, we observed a continuous annual increase in the number of patients receiving procedural treatment within the first year of diagnosis. Following the introduction of cryoablation in Republic of Korea in 2018, alongside with RFCA, the adoption of this procedural treatment has progressively increased.

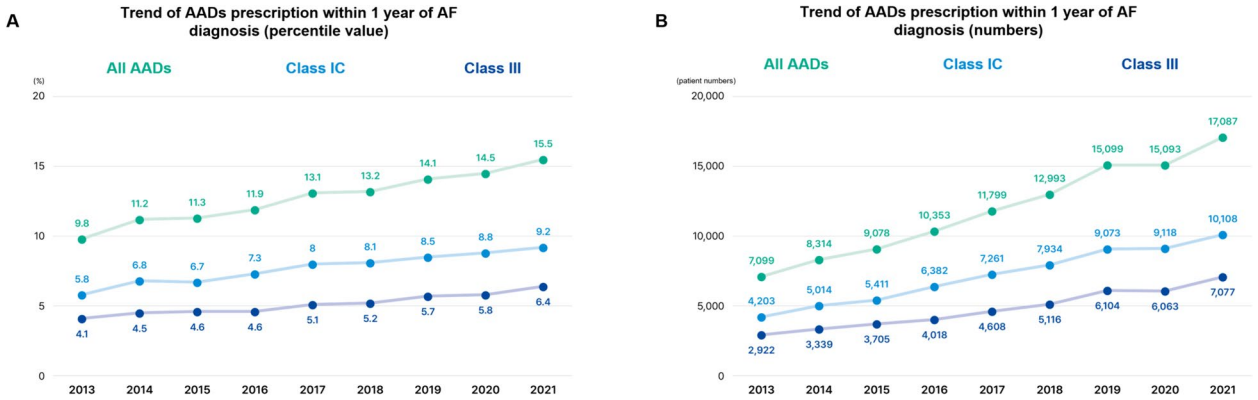

Fig. 3 Patient number who initiated AADs within 1 year of new-onset AF diagnosis. AAD: antiarrhythmic drug; AF: atrial fibrillation

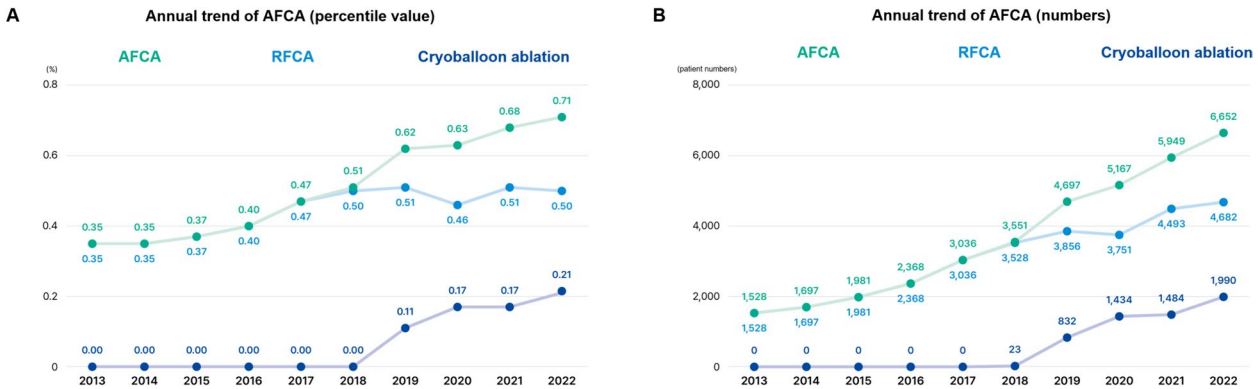

Fig. 4 Annual trend of patient numbers who underwent de-novo ablation procedures among prevalent AF patients. Only de-novo procedures were counted. AAD: antiarrhythmic drug; AFCA: atrial fibrillation catheter ablation; RFCA: radiofrequency catheter ablation

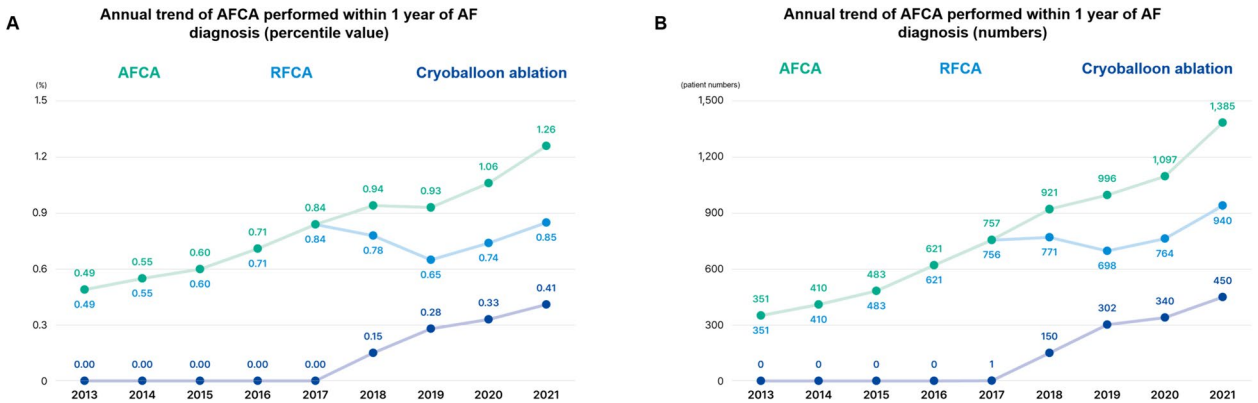

Fig. 5 Number of patients who performed AFCA within 1 year of diagnosis of new-onset AF. AAD: antiarrhythmic drug; AFCA: atrial fibrillation catheter ablation; RFCA: radiofrequency catheter ablation

Reflecting global trends, the frequency of elective cardiac procedures in Korea plateaued during 2019 and 2020 due to the COVID-19 pandemic but has since resumed its upward trajectory, indicating a rebound in AFCA post-pandemic 24. With advancements in AFCA technologies, including radiofrequency, cryoballoon, and emerging pulse field ablation, a substantial increase in AFCA utilization is anticipated.

Regional disparities in AF management

The observed regional variations in the prescription rates of AADs and the frequency of AFCA, highlighted by higher rates in Seoul compared to Gyeongsangnam-do, can be attributed to multiple factors. High AF treatment costs and varying clinician preferences by institution and specialty shape regional trends 25. A Korean study found lower oral anticoagulant use in suburban and rural areas compared to urban regions, despite more severe comorbidities, due to limited medical access, lower AF management awareness, and differences in income and education level 26. Similar patterns are seen in the USA, reflecting socioeconomic and healthcare access disparities 27.

Limitations

Our study has limitations inherent to retrospective analysis using the K-NHIS database, which relies on ICD-10 codes for diagnosing AF. First, this reliance may lead to under-detection of paroxysmal or asymptomatic AF cases. Second, we were not able to classify AF into paroxysmal or persistent AF. The severity of symptom or AF burden which can have significant influence on treatment pattern could not be evaluated. Third, the database may not fully capture patient histories or sign of AF progression. Treatment response across different regions could not be evaluated. Despite these limitations, our study provides valuable insights into AF management in Korea.

Conclusion

This study underscores significant advancements in AF management in Republic of Korea, characterized by the increased adoption of AADs and AFCA procedures over the past decade. These trends are consistent with contemporary AF guidelines advocating a refined rhythm control strategy, supported by robust scientific evidence. Further research is essential to optimize AF management across all patient populations.

Abbreviations

AAD	Antiarrhythmic drug
AF	Atrial fibrillation
CI	Confidence interval
HR	Hazard ratio
ICD-10	International classification of disease, 10th edition
K-NHIS	Korean national health insurance service

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s42444-024-00122-9.

Supplementary Material 1.

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Author contributions

J. Shim takes full responsibility for this work. Study design was made by J. Shim and J. K. Park. Funding was obtained by J. Shim. Data collection was done by B. S. Kim, K. D. Han, H. S. Park, and J. Ahn. Data analysis was performed by Y. G. Kim, K. N. Lee, Y. S. Back, B. S. Kim, and K. D. Han. Manuscript was prepared by Y. G. Kim, K. N. Lee, Y. S. Back, J. K. Park, and J. Shim. Manuscript was reviewed by H. S. Park, and J. Ahn. All authors read and approved the final manuscript.

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Availability of data and materials

The underlying data of this study cannot be opened to public since the K-NHIS possess the data and legally prohibits data sharing.

Declarations

Ethics approval and consent to participate

The Institutional Review Board of Seoul National University Hospital and the official review committee of the K-NHIS both approved this specific study. Legal regulations of Republic of Korea and the ethical guidelines of the 2013 Declaration of Helsinki were strictly adhered throughout the study. The Institutional Review Board of Seoul National University Hospital waived the requirement for written informed consent because this study was based on retrospective analysis.

Consent for publication

All authors approved publication of the manuscript.

Competing interests

The authors have nothing to disclose.

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References

1. Kim D, Yang P-S, Jang E, et al. 10-year nationwide trends of the incidence, prevalence, and adverse outcomes of non-valvular atrial fibrillation nationwide health insurance data covering the entire Korean population. Am Heart J. 2018;202:20–6.
2. Lee H, Kim T-H, Baek Y-S, et al. The trends of atrial fibrillation-related hospital visit and cost, treatment pattern and mortality in Korea: 10-year nationwide sample cohort data. Korean Circ J. 2017;47:56.
3. Lee S-R, Choi E-K. Prevalence of atrial fibrillation in Korean population. Int J Arrhythm. 2017;18:195–204.
4. Lee S-R, Choi E-K, Kim J-H, et al. Comparative clinical outcomes of dronedarone and sotalol in Asian patients with atrial fibrillation: a nationwide cohort study. Sci Rep. 2020;10:16102.

5. Lim HE, Oh I-Y, Kueffer FJ, van Bragt KA, On YK. Cryoballoon catheter ablation in Korean patients with paroxysmal and persistent atrial fibrillation: one year outcome from the Cryo global registry. Korean Circ J. 2022;52:755.
6. Joung B, Lee JM, Lee KH, et al. 2018 Korean guideline of atrial fibrillation management. Korean Circ J. 2018;48:1033–80.
7. Kim D, Yang P-S, Joung B. Optimal rhythm control strategy in patients with atrial fibrillation. Korean Circ J. 2022;52:496.
8. Chugh SS, Roth GA, Gillum RF, Mensah GA. Global burden of atrial fibrillation in developed and developing nations. Glob Heart. 2014;9:113–9.
9. Schnabel RB, Yin X, Gona P, et al. 50 year trends in atrial fibrillation prevalence, incidence, risk factors, and mortality in the Framingham heart study: a cohort study. Lancet. 2015;386:154–62.
10. Kirchhof P, Camm AJ, Goette A, et al. Early rhythm-control therapy in patients with atrial fibrillation. N Engl J Med. 2020;383:1305–16.
11. Kim D, Yang P-S, You SC, et al. Treatment timing and the effects of rhythm control strategy in patients with atrial fibrillation: nationwide cohort study. BMJ. 2021;373:n991.
12. Hindricks G, Potpara T, Dagres N, et al. 2020 ESC guidelines for the diagnosis and management of atrial fibrillation developed in collaboration with the European association for cardio-thoracic surgery (EACTS) the task force for the diagnosis and management of atrial fibrillation of the European society of cardiology (ESC) developed with the special contribution of the European heart rhythm association (EHRA) of the ESC. Eur Heart J. 2021;42:373–498.
13. Joglar JA, Chung MK, Armbruster AL, et al. 2023 ACC/AHA/ACCP/HRS guideline for the diagnosis and management of atrial fibrillation: a report of the American college of cardiology/American heart association joint committee on clinical practice guidelines. Circulation. 2024;149:e1–156.
14. Andrade JG, Deyell MW, Lee AY, Macle L. Sex differences in atrial fibrillation. Can J Cardiol. 2018;34:429–36.
15. January CT, Wann LS, Alpert JS, et al. 2014 AHA/ACC/HRS guideline for the management of patients with atrial fibrillation: executive summary: a report of the American college of cardiology/American heart association task force on practice guidelines and the heart rhythm society. Circulation. 2014;130:2071–104.
16. Hjerteavdelingen U. ESC Guidelines for the management of atrial fibrillation developed in collaboration with EACTS. Eur Heart J. 2016;2016:37.
17. Cosedis Nielsen J, Johannessen A, Raatikainen P, et al. Radiofrequency ablation as initial therapy in paroxysmal atrial fibrillation. N Engl J Med. 2012;367:1587–95.
18. Andrade JG, Wells GA, Deyell MW, et al. Cryoablation or drug therapy for initial treatment of atrial fibrillation. N Engl J Med. 2021;384:305–15.
19. Wazni OM, Dandamudi G, Sood N, et al. Cryoballoon ablation as initial therapy for atrial fibrillation. N Engl J Med. 2021;384:316–24.
20. Andrade JG, Deyell MW, Macle L, et al. Progression of atrial fibrillation after cryoablation or drug therapy. N Engl J Med. 2023;388:105–16.
21. Morillo CA, Verma A, Connolly SJ, et al. Radiofrequency ablation vs antiarrhythmic drugs as first-line treatment of paroxysmal atrial fibrillation (RAAFT-2): a randomized trial. JAMA. 2014;311:692–9.
22. Turakhia MP, Santangeli P, Winkelmayer WC, et al. Increased mortality associated with digoxin in contemporary patients with atrial fibrillation: findings from the TREAT-AF study. J Am Coll Cardiol. 2014;64:660–8.
23. Wyse DG, Waldo AL, DiMarco JP, et al. A comparison of rate control and rhythm control in patients with atrial fibrillation. N Engl J Med. 2002;347:1825–33.
24. El-Andari R, Fialka NM, Nagendran J. The impact of resource allocation during the COVID-19 pandemic on cardiac surgical practice and patient outcomes: a systematic review. Eur J Cardiothorac Surg. 2023;63:ezad230.
25. Ko Y-J, Kim S, Park K, et al. Impact of the health insurance coverage policy on oral anticoagulant prescription among patients with atrial fibrillation in Korea from 2014 to 2016. J Korean Med Sci. 2018;33:e163.
26. Lee S-R, Choi E-K, Han K, Cha M-J, Oh S. Prevalence of non-valvular atrial fibrillation based on geographical distribution and socioeconomic status in the entire Korean population. Korean Circ J. 2018;48:622.
27. Barrett TW, Self WH, Jenkins CA, et al. Predictors of regional variations in hospitalizations following emergency department visits for atrial fibrillation. Am J Cardiol. 2013;112:1410–6.