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Atrial fibrillation fact sheet in Korea 2024: part 2—stroke prevention in Korean patients with atrial fibrillation

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Abstract

Objective Atrial fibrillation (AF) increases the risk of thromboembolic events, making oral anticoagulants (OACs) essential for high-risk patients. This fact sheet provides nationwide statistics on AF management for stroke prevention in Korea. We aimed to evaluate current anticoagulation treatment trends and strategies in Korea.

Method The Korean national health claims database from the National Health Insurance Service was used. AF patients aged ≥ 18 years from 2013 to 2022 were included. OAC use, including warfarin and non-vitamin K antagonist OACs (NOACs), was tracked through prescription data. The rates of OAC use were calculated based on continued use, considering prescription dates and amounts. For patients with multiple encounters, the last encounter was used for analysis.

Results During the study, 20.4% of strokes were accompanied by AF, with AF diagnosed within 6 months before or after the stroke. The number of patients diagnosed with AF after a stroke increased from 4893 in 2013 to 6978 in 2022. Among newly diagnosed AF patients requiring OACs, 51% were not prescribed OACs within 6 months. OAC treatment rates for high-risk AF patients increased from 44.6% in 2013 to 77.5% in 2022, with NOAC prescriptions rising significantly after 2015. Regional variations in OAC prescription rates were observed, with lower rates in suburban/rural areas than in urban regions (76.0% vs. 79.6%, $p < 0.001$).

Conclusions Considerable strokes could have been prevented with earlier AF detection and OAC treatment through more intensive electrocardiogram screening.

Keywords Atrial fibrillation, Anticoagulants, Stroke, Thromboembolism

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Introduction

Atrial fibrillation (AF) is associated with an increased risk of thromboembolic events. Therefore, proper anticoagulation is essential for high-risk patients with an absolute risk of stroke > 2%/year [1]. The CHA_2DS_2-VASc score is the most commonly used risk score system. In Korean Arrhythmia Society non-vitamin K antagonist oral anticoagulant (NOAC) guidelines, anticoagulation is recommended to prevent stroke and systemic embolism in patients with CHA_2DS_2-VASc score ≥ 2 in men and ≥ 3 in women. Furthermore, NOACs are preferred over warfarin for stroke prevention in AF in the current guidelines [2, 3]. In randomized pivotal NOAC trials, all NOACs proved their noninferiority or superiority to warfarin in stroke prevention [4–7]. In Korea, the oral anticoagulation prescription rate has been increasing since physicians began prescribing NOAC. Nevertheless, many patients still do not receive treatment [8, 9]. Additionally, adherence to NOAC use is associated with favorable clinical outcomes [9, 10].

Therefore, evaluating current treatment trends and strategies for stroke prevention in patients with AF is needed. This AF fact sheet aimed to provide nationwide statistics on the management status of AF for stroke prevention in Korea. We aimed to investigate the correlation between stroke and AF, the prescription rate of oral anticoagulants (OACs), and modifiable risk factors associated with stroke risks by analyzing nationwide data.

Methods

This study was based on the national health claims database established by the National Health Insurance Service (NHIS) of Korea (NHIS-2023-1-827) [11–13]. The entire Korean population is mandatory to be enrolled to the NHIS, the single insurer managed by the Korean government. Thus, the NHIS database represents the entire Korean population. Each person in the NHIS database was linked by the Korean social security number, and all social security numbers were deleted after constructing the cohort. We confirmed diagnoses by using the International Classification of Diseases, Tenth Revision (ICD-10) codes. From the Korean NHIS data, AF patients aged ≥ 18 years were identified from January 1, 2013, to December 31, 2022. OACs included warfarin, dabigatran, rivaroxaban, apixaban, and edoxaban. The rates of OAC use were calculated by considering the continued use of OAC in each period and prescription date and amount. Prescription data were obtained from NHIS outpatient encounter documentation. For patients with multiple encounters, the last encounter was used in the analysis. Stroke accompanied by AF was defined as a case in which AF was diagnosed within 6 months before or after the stroke. Detailed methodology is described in the AF fact sheet in Korea 2014 – Part 1. AF epidemiology and following uniformed statistical analysis. This study was approved by the institutional review board of Seoul National University Hospital (E-2306-004-1435).

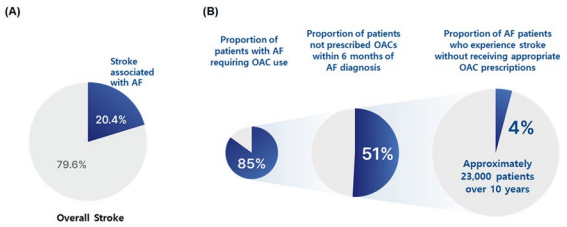

Fig. 1 **A** The proportion of strokes accompanied by AF in Korea. **B** The proportion of patients diagnosed with AF but not received appropriate OAC prescriptions until a stroke event. *AF* atrial fibrillation, *OAC* oral anticoagulant

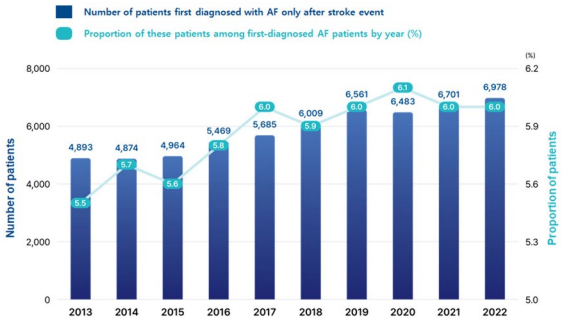

Fig. 2 Among patients diagnosed with AF for the first time, the proportion of patients diagnosed with AF only after a stroke occurs. *AF* atrial fibrillation

Results

Strokes accompanied by AF

During the study, 20.4% of ischemic strokes were accompanied by AF, with AF diagnosed within 6 months before or after the ischemic stroke (Fig. 1A). The proportion of patients diagnosed with AF but not received appropriate OAC prescriptions until a stroke occurred was 4% (Fig. 1B). The number of patients with a first-time diagnosis of AF only after a stroke gradually increased from 4893 in 2013 to 6978 in 2022 (Fig. 2). Over 10 years from 2013 to 2022, 58,617 patients were first diagnosed with AF after experiencing a stroke. The proportion of such patients among first-diagnosed AF patients each year also increased from 5.5% in 2013 to 6.0% in 2022. Thus, stroke could have been prevented in many patients if AF had been detected, followed by OAC treatment before the stroke, through more intensive electrocardiogram (ECG) screening.

OAC prescription rates after the first diagnosis of AF

The proportion of patients with first diagnosed AF requiring OACs (CHA_2DS_2-VASc score of ≥ 2 in men and ≥ 3 in women) was 85%. However, 51% of these patients were not prescribed OAC even 6 months after AF diagnosis. Additionally, the proportion of patients who had already been diagnosed with AF but were not prescribed appropriate OACs until a stroke occurred was 4%. Converting this to numbers, it amounts to approximately 23,000 patients over 10 years (Fig. 1B).

Temporal trends of antithrombotic therapy prescription

Figure 3 shows the prescription rates of antithrombotic treatment from 2013 to 2022 in AF patients at high risk for stroke (CHA_2DS_2-VASc score ≥ 2 in men and ≥ 3 in women) for whom OAC use was recommended. The proportion of patients receiving OAC treatment (warfarin or NOACs) increased from 44.6% in 2013 to 77.5% in 2022 ($p < 0.001$). In 2013 and 2014, before NOACs were fully reimbursed by the Korean NHIS, the prescription rate for NOACs was low at 4.4% and 3.6%, respectively. However, with the full reimbursement of NOACs in 2015, the prescription rate for NOACs rapidly increased to 24.7% in 2015 and continued to rise consistently to 72.1% in 2022 ($p < 0.001$). On the other hand, the warfarin prescription rate, which was 43.3% in 2013, decreased sharply after NOAC introduction, eventually falling to 6.6% in 2022 ($p < 0.001$). The prescription rate of antiplatelets also decreased from 64.1% in 2013 to 32.0% in 2022 ($p < 0.001$).

OAC prescription rate according to the CHA_2DS_2-VASc score

Table 1 shows the OAC prescription rate in patients with AF according to the CHA_2DS_2-VASc score in Korea in 2022. In the current AF guidelines, female sex is a stroke risk modifier rather than a risk factor. Therefore, we also present the OAC prescription rate based on the CHA_2DS_2-VASc score, excluding the female risk factor.

Differences in OAC prescription rates by region in Korea

Figure 4 presents the regional patterns of OAC prescription in 17 geographical regions of Korea. We observed regional variations in the OAC prescription rate, with the lowest and highest rates in Jeollabuk-do (64.9%) and Jeju-do (82.1%), respectively. In Korea, the rate of

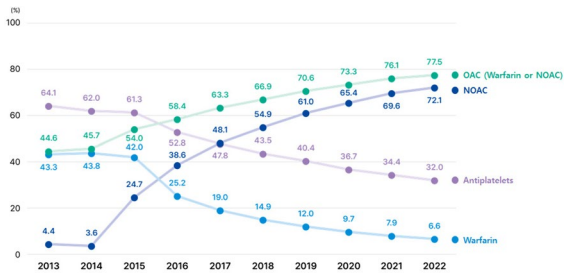

Fig. 3 Temporal trends in OAC (warfarin and NOAC) and antiplatelet prescription rates in patients with AF. *AF* atrial fibrillation, *NOAC* non-vitamin K antagonist oral anticoagulant, *OAC* oral anticoagulant

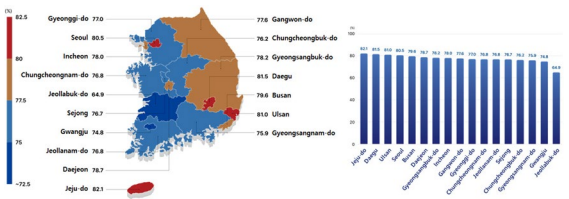

Fig. 4 Differences in OAC prescription rates in AF patients by region in Korea in 2022. *AF* atrial fibrillation, *OAC* oral anticoagulant

Table 1 OAC prescription rate in AF patients according to CHA_2DS_2-VASc score in 2022

CHA_2DS_2-VASc score	Overall (%)	CHA_2DS_2-VASc score excluding female risk factor	Overall (%)	Male (%)	Female (%)
0	25.8	0 (low risk)	26.1	25.8	26.5
1	41.8	1 (intermediate risk)	47.4	44.5	54.1
2	66.7	2	70.6	70.2	71.5
3	76.4	3	77.8	78.5	76.7
4	78.6	4	79.3	80.3	78.2
5	79.6	5	80.3	81.5	79.0
6	80.0	6	80.5	81.7	79.4
7	79.7	7	80.0	80.5	79.6
8	79.6	8	78.0	79.2	77.0
9	77.0	–	–	–	–

AF atrial fibrillation, *CHA_2DS_2-VASc* congestive heart failure, hypertension, age ≥ 75 years, diabetes mellitus, prior stroke, transient ischemic attack, or thromboembolism, vascular disease, age 65–74 years, sex category (female), *OAC* oral anticoagulant

OAC prescriptions in suburban/rural regions tended to be lower compared to urban regions (76.0% vs. 79.6%, $p < 0.001$).

Discussion

This is our first report of the fact sheet for stroke prevention in AF. Over 20% of strokes in Korea were associated with AF. Of them, 5–6% of patients were diagnosed with new-onset AF that had caused stroke. Therefore, appropriate screening of AF is necessary to reduce the risk of developing stroke associated with AF. Furthermore, the proportion of patients already diagnosed with AF but not prescribed appropriate OACs until a stroke occurred was 4% (approximately 23,000 patients over 10 years). The prescription rate for OACs increased from 44.6 to 77.5% over 10 years. Specifically, the rate of OAC use increased significantly after NOACs emerged. The use of antiplatelet agents decreased over time. Moreover, there was a regional variation in the OAC prescription rate in Korea (the lowest and highest prescription rates were 64.9% and 82.1%, respectively). The OAC prescription rate in suburban/rural regions tended to be lower compared to urban regions (76.0% vs. 79.6%, $p < 0.001$).

Warfarin was the only OAC used to prevent stroke in AF until NOACs emerged. A narrow therapeutic range, frequent drug or food interactions, and an increased risk of intracranial hemorrhage, especially in Asians, limit its appropriate use in clinical practice [14–17]. These limitations influence the physician's decision not to prescribe an OAC. Since 2015, NOACs have been claimed by insurance for stroke prevention in AF. Therefore, the prescription rate of OACs has increased significantly since 2015 in Korea, reaching 70%–80% of patients at high risk of stroke currently using anticoagulation therapy. While some patients still underuse OACs, > 2000 patients are diagnosed with stroke and AF annually and receive no anticoagulation. About 6% of patients were first diagnosed with AF after experiencing ischemic stroke. Undiagnosed AF patients might develop complications and are at risk of poor outcomes. Therefore, intensive screening of AF, especially in individuals at high risk of stroke, with immediate anticoagulation treatment is necessary. Furthermore, treatment adherence and maintenance are important factors in preventing stroke in AF. A low adherence rate of NOACs increased the stroke risk by 37% compared to a high adherence rate. The factors influencing treatment adherence or maintenance might be bleeding history, fewer comorbidities, or concomitant antiplatelet agent use [18, 19]. Therefore, patients with AF should be periodically evaluated for their stroke risk, bleeding risk, or other comorbidities and receive proper anticoagulation as necessary.

Many reports established that modifying risk factors and adopting a healthy lifestyle may be associated with reduced risk of AF, including blood pressure control, body weight control, alcohol consumption, smoking, and physical activity [20–24]. These lifestyle modifications can reduce the incidence of AF and lower the risk of stroke associated with AF [25–27]. These factors are associated with an increased risk of both AF and stroke. Additionally, lowering the occurrence of AF might lower the incidence of stroke. Therefore, in addition to anticoagulation therapy, patients at increased risk of stroke in AF should be educated on comprehensive lifestyle modifications.

In conclusion, this is our first fact sheet about the association between AF and stroke. Based on this report, we could consider the current strategy of stroke prevention in AF. Thus, more appropriate and effective anticoagulation therapy is expected in the future.

Supplementary Information

The online version contains supplementary material available at https://doi.org/10.1186/s42444-024-00120-x.

Supplementary Material 1.

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Author contributions

PS: data curation, formal analysis, methodology and original draft writing. JY: investigation, methodology and original draft writing. BS: data curation, formal analysis and software. KD: conceptualization and validation. JB: investigation and methodology. MS: investigation and methodology. JM: investigation and visualization. JS: conceptualization, methodology, visualization and manuscript review. KH: conceptualization, methodology, visualization, validation and manuscript review/editing. All authors read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analysed during the current study are available from the corresponding author on reasonable request.

Declarations

Ethics approval and consent to participate

This study was approved by the institutional review board of Seoul National University Hospital (E-2306-004-1435). Informed consent for patient information to be published in this article was not obtained and exempted because of the anonymous data collection from NHIS.

Consent for publication

Not applicable.

Competing interests

The authors declare that they have no competing interests.

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